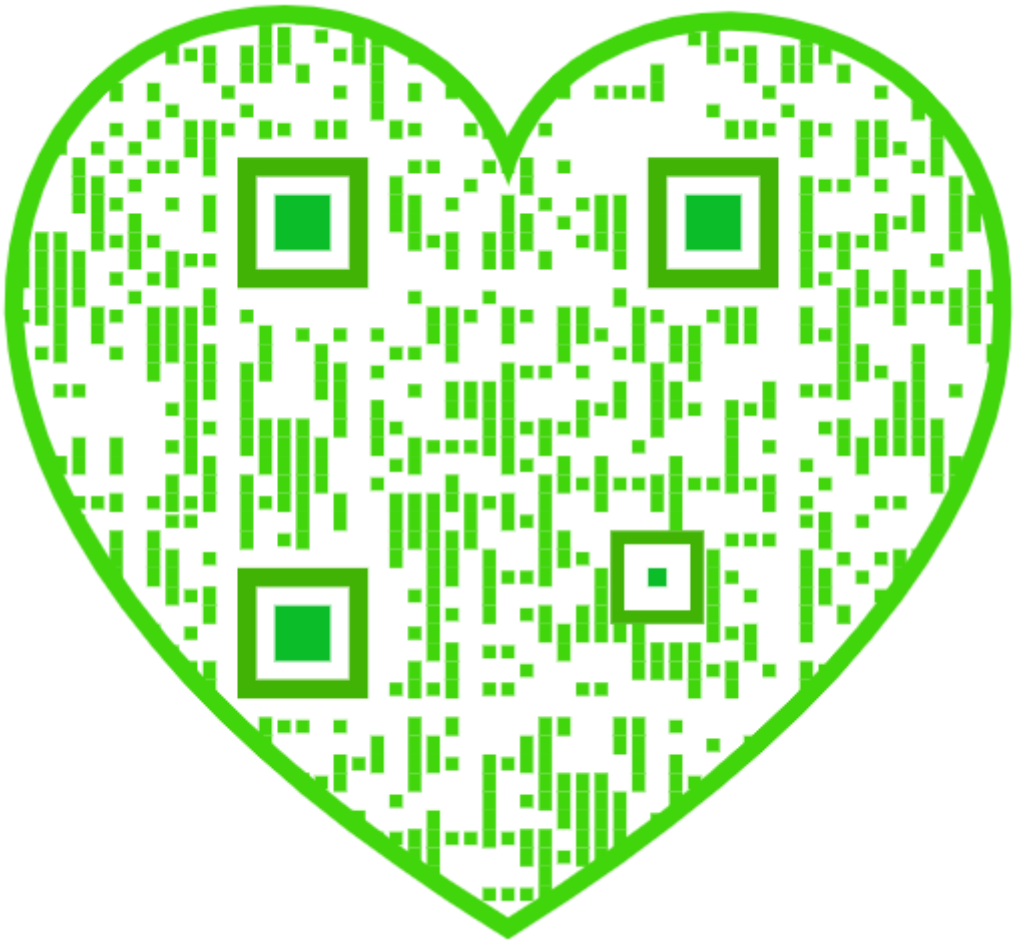
HORSE BACK RIDING

GHISLANI DURANT.



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RESEARCHES

ON THE PHYSIOLOGY OF THE

Nervous Ganglionic System,

AND THEIR

APPLICATION TO PATHOLOGY.

On the Cause, Prevention, and Cure

OF

TUBERCULOUS PHTHISIS,

BEING THE ESSAY TO WHICH THE MEDICAL SOCIETY OF THE STATE OF NEW YORK AWARDED THE "HIRAM CORLISS" PRIZE.

ON CONSUMPTION,

TO WHICH ESSAY WAS AWARDED THE GOLD MEDAL OF THE ALUMNI ASSOCIATION OF THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF NEW YORK.

HYGIENE OF THE VOICE:

ITS PHYSIOLOGY AND ANATOMY.

SEA-BATHING:

ITS USE AND ABUSE.

HORSE-BACK RIDING,

FROM A

MEDICAL POINT OF VIEW.

BY

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GHISLANI DURANT.

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HORSE-BACK RIDING.

I.

OF MOVEMENT IN THE FUNCTIONS OF LIFE.

"Bodily labor is of two kinds, either that which a man submits to for his livelihood, or that which he undergoes for his pleasure. The latter of them generally changes the name of labor for that of exercise, but differs only from ordinary labor as it rises from another motive.

". . . . . I might here mention the effects which this has upon all the faculties of the mind, by keeping the understanding clear, the imagination untroubled, and refining those spirits that are necessary for the proper exertion of our intellectual faculties, during the present laws of union between soul and body.

". . . . . To conclude, as I am a compound of soul and body, I consider myself as obliged to a double scheme of duties; and think I have not fulfilled the business of the day when I do not thus employ the one in labor and exercise, as well as the other in study and contemplation. ADDISON."

IT is only necessary to observe man in the nature and diversity of his acts, and in his peculiar constitution, to see that he is a complex being, *mind* and matter, during the entire length of his active existence.

We find the proof of this in all the acts of his life, and recognize its necessity in all the distinctive

phenomena of his species; and from the reciprocal and harmonious reaction of mind and matter results his perfect development.

For a long time physiologists have considered the various phenomena, which are the manifestations of organic life, to be produced by some hidden forces. These forces have received various names, the most prominent among them being bone (Van Helmont), soul (Stahl), and vital principles (Bartles). A very slight consideration of the meaning to be attached to the terms vital force and vital principle will convince us that they both mean one and the same thing, and that under these two names modern physiologists designate that force residing in the individual upon which depend the phenomena or attributes by means of which life manifests itself. This is the force which, when acting upon matter, vivifying it, as we may say, causes it to take a particular form, which presides over the function of nutrition, which perpetuates the various races, which forces organized matter to take on a predetermined specific form.

The principle of life is not a question for us now to discuss. The arguments on that point, though always in the mouths of men, are yet very far from being settled. Two conflicting opinions stand confronting each other. The first, held by Zenon, Epicureus, Cabanis, Broussais, etc., represents matter active in and of itself, sole cause of all the phenomena of nature; and to these philosophers life is but an effect

of that activity. In the other, on the contrary, life is a principle of the activity of matter, a force which necessitates certain acts, indeed, a cause of the first phenomena of the living being, outside of all qualities of structure.

This latter view of the question is advocated by Plato, Hippocrates, and Galen, as well as by Stahl, Boerrhave and Hoffman, that great triumvirate of the eighteenth century, to whom the most immediate expression of life was motion.

We find the first principle of the system of the latter to be that the human body, as well as all other bodies in nature, possesses material forces by means of which it moves. A body, simply because it is a body, has forces of cohesion and of resistance which are given it by the Creator.

That imponderable material agent, ether, the active *motor force*, animates all the properties of bodies, and presides over all the physical phenomena in the unity of the creation. Thus the living mechanism performs the functions which are peculiar to it, by virtue of the properties assigned to animal matter; and the activity of those properties resides essentially in the power of a special ether secreted by the brain, and carried to all the parts of the organism by a very complicated organic apparatus.

That ether is the primary and efficient cause of all vital movements. *It* it is which animates all the organs, and each of them ceases to perform its func-

tions from the moment it no longer receives the vivifying and animating ether.

The nervous fluid is to Hoffman, then, nothing else but the sensitive soul presiding over the organism and constituting the mere life of man.

Essentially material, that sensitive soul is entirely different from the spiritual soul which is momentarily united to the living body. The seat of the conscience and source of reasoning, that spiritual soul elevates the man from a mere animal to an intellectual, responsible being.

That idea of a sensitive and perishable soul, distinct from the thinking and immortal soul, is but a tradition of antiquity. It goes back to Cicero, Plato, Pythagorus; to the Persian, Indian, and Chinese philosophy. It reaches the origin of man.

Frederick Hoffman, then, makes life dependent on the organization, and not at all on the spiritual principle of which it is the home. Life, then, is the circulating movement of the blood, and the humors produced and kept up by the impulse of the heart and arteries, by the contractions of the dura mater, and the vibrations of the meninges which, sending the ether or nervous fluid to all parts of the body, penetrate them with regular movements. Life is the product of the organization set in motion by the laws assigned to organized matter.

Embryonic, man is but an organized and focundated molecule living his life by the life of his

mother, who carries him in her womb. Thus life, through woman, goes back to the Creator, and all the generations of men are joined in the unity of a same origin, and of a single and identical species. The child is born, but its life is still latent. An atmospheric pressure necessitates the action of the respiratory nerves ; the child breathes, and the whole living mechanism moves, is warmed up. The child having once breathed, it lives of its own life and grows incessantly in divers and varied ways ; for the living mechanism finds itself incessantly in relation with the elements of the exterior world, gravity, light, heat, electricity ; with the geographical and geological influences ; with all things of which the reciprocal influences are increasing, and against which he reacts without cessation.

Thus man continues on his own account the life which he has begun through his mother ; he lives now his own individual life. From the air he draws incessantly the gas which purifies his blood. It is first in the blood elaborated by his mother, and afterwards in that which he himself elaborates with the material of alimentation that he draws the elements of the nutrition of the nervous, the muscular, and of the vascular system—of the whole entire mechanism ; and that, by divers and varied non-interrupted series of actions and reactions, co-operates in the unity of his being. And we may well say with Daly, the individual life upon earth will end as it has begun. It

has begun by an expiration of the celestial world into the terrestrial; as mysteriously it ends! The individual life ascends towards its Creator; the elements, disassociated, dissolve and pass into new combinations. Nothing dies.

Developing the body, and when developed, putting to their proper use the forces that exist, alone can maintain in a salutary state of activity the transformation and renewal of the organic matter, which is the fundamental condition of life. A break in that transformation and renewal may bring on any of the thousand ills that flesh is heir to.

Full of that truth, physicians have in all ages urged that well-advised corporeal movements were to be considered as an indispensable condition of the preservation, and even, under some circumstances, of the re-establishment of health.

In order that man may maintain himself in a normal state, that is to say in a state of health, and develop himself in conformity with the destination of his nature, a bodily and spiritual activity corresponding to the measure of his individual forces is absolutely necessary. But the entire activity of the body is much more indispensable than that of the mind, as we shall presently see.

The ensemble of the organic life rests upon an unceasing renewal of matter; upon an elimination of that which has grown old, which the vital act has rendered unfit to be made use of; and upon the assim-

ilation of a new quantity of organic matter under a suitable form, the elements of which the body draws from the blood and the air breathed.

"The flame of life," says Schræber, "from the first pulsation to the last is continually lighted at the stove of the transformation of matter." Hence, the more rapid and complete the renewal of the substance of the body, that transformation of matter grown old, in other more fresh, the more life will gain in freshness, in strength, and in duration.

Thus, in order that our body be well, it is necessary that the molecules constituting it be renewed, be constantly made young again. Any departure from this order of phenomena, if not rapidly compensated, produces suffering, disease, death.

But the stimulation of the renewal of matter and the refreshing of life is determined generally by the activity of the organs of the body, as long as there is a harmonious relation kept up between exercise and the time of repose.

The movements which are accomplished by the animal economy, says Béclard, are numerous and varied. The most striking and extended are the movements of totality, that is to say, the movements of *locomotion*, by virtue of which man and the animals voluntarily change their relations with other bodies and move in the midst of surrounding objects. Of these movements are walking, running, swimming, etc. Another order we might call *partial*

movements, or movements *in situ*, and which we observe in man with a degree of frequency and complexity, varied almost *ad infinitum*, consist in the change of relation of the divers segments which compose the skeleton : changes of situation, by virtue of which the members play the most important part, although the trunk itself generally participates in the motion.

But even when man or the animals do not execute the extended movements of which we have spoken, they are still far from being immobile. The thoracic cage is each instant raised and lowered, moved by the filling of the lungs, and by their return to their first dimensions, the entrance and exit of the air necessary to respiration. The digestive tube and the stomach work upon the aliments contained in their cavity. At certain moments, which correspond with the feeling of hunger and thirst, food is brought to the mouth and taken by it ; the tongue, the teeth, jaws and pharynx set to work each in their way, to divide the food, to masticate and swallow it, etc. . . . And when digestion is accomplished, the residue is expulsed by the active forces of defecation.

At every movement the heart contracts on the blood which is brought to it, and sends it to the arteries. The arteries, capillaries, and veins work upon that liquid by a retrograde movement due to the elasticity of their walls, and also, in certain con-

ditions, by virtue of the contractile power inherent in their coverings.

The divers functions of the organs of the senses, the production of the sound of the voice, that of speech, necessitate also varied, and more or less complicated movements, not only in the position of the organ of the sense taken as a whole, but also in reciprocal relations of its divers constituting parts.

It may be said in a general way, that all the functions of the economy are accompanied by movements.

II.

MEDICAL GYMNASTICS.

"MESSIEURS :

"La gymnastique médicale, considérée par les anciens comme un des moyens les plus puissants d'éducation et d'hygiène publiques, devait être abandonnée à une époque ou la partie matérielle de l'être semblait méprisable et sans valeur et était souvent traitée en ennemie.

"On revient aujourd'hui a des idées plus justes, et l'on commence à comprendre l'importance de la forme faite à l'image de Dieu et jugée digne de recevoir une âme immortelle.

"Ce n'est certainement pas sans une profonde sagesse que le corps et l'esprit ont été associés par le Créateur, et la beauté plastique, quoique inférieure à la beauté morale, n'en mérite pas moins l'attention des médécins et des philosophes."

(SÉDILLOT, Soc. de Méd. Strasbourg, Juin, 1854.)

IT has always been acknowledged that bodily exercise is the surest and most efficacious means of preserving health or re-establishing it where altered or upset. It is a recognized fact that individuals who pass their lives in idleness, and without taking any kind of exercise, never enjoy good health ; that they are subject to an infinity of maladies, their fibres are weak and relaxed, the organs become benumbed and lazy. They begin by losing appetite, because the digestive faculties work badly ; their bodies grow fat, and, overloaded with an incommodious *embon-*

point, soon become incapacitated for most occupations.

Exercise, on the contrary, increases the strength; the blood circulates more freely, and with more uniformity; the fibres become stronger and more elastic; all the humors receive a more perfect elaboration; the nervous fluid separates from the brain in greater quantity, to spread itself through the nerves, and all the functions of the body are performed and movements made with more energy and ease.

From a medical point of view, movements take place in the muscles, the bones, the tendons, and in all the soft parts of the body. They are divided into three classes: *Active*, *passive*, and *mixed*.

Active movement or exercise is the one executed voluntarily by the individual alone. In this the body is the sole agent of the movement, as in walking, running, jumping, dancing. All the movements of the thoracic and abdominal members are exercises which result exclusively from muscular contractions.

In *passive* exercise the person is moved, not offering the slightest resistance; or again it may consist in the agitation of the body by means of machines upon which the individual is placed, or which transport him from one place to another, such as carriage-driving, etc.

Most exercises, however, partake at the same time of both of the above-mentioned kinds, and require that the individual, although supported and sub-

jected to a motion communicated by a foreign body, act, however, either to preserve certain attitudes or to communicate motion to the machine or instrument upon which he may be placed; in a word, that certain parts of himself participate in the motion.

To this class of exercises belongs *horse-back riding*, for we have here two orders of movements, those that the horse executes and those made by the rider to keep himself in equilibrium on a movable base, as well as to govern his animal. In other words, the communicating force, the horse, and the active force, the rider.

But to appreciate fully the advantages of horse-back riding, it is necessary to study first the local as well as the general effects produced by active and passive exercises.

1. *Effects of active exercises.*—In order to form an idea of the influence of active exercises on the economy, it is sufficient to examine the condition of the members that are much exercised.

If you set a part to work for a while, you see it first swell from the afflux of a larger quantity of blood; the heat becomes greater there, and if you repeat habitually the same movements, you see develop in the part which executes them a greater perfection of action, an increase of nutrition and of energy.

It is not only the organs of active movements that experience such effects. The nutritive functions be-

come better and more active under their influence, and when the muscles are much exercised, they generally communicate an increased activity to the viscera. Following work and fatigue, the need of food becomes more frequent and more imperious; the stomach, more active, digests greater quantities.

A moderate exercise after meals renders digestion easier and consequently more perfect, so much so that persons who have contracted the habit experience the imperious need of it, and digest badly when they cannot satisfy it.

Active exercises always cause acceleration of the circulation and respiration. Many movements modify in a very powerful manner this last function; some by simply accelerating it, others by exacting sustained and frequent dilatations of the thorax indispensable to the execution of sustained efforts.

Calorification, which is generally only a result of the nutritive functions, is greatly increased by the force, duration, and specially the frequency of active exercises. We know that perspiration is always more or less increased by those exercises. The other secretions or exhalations are not more abundant, some even seem diminished.

Moderate active exercise renders nutrition more perfect in all the organs of the economy; there is not one of them that does not show its influence, since all participate in the molecular agitations which the movement of the members cause in the whole body.

That increase of nutrition is, besides, a consequence of the greater activity of the principal visceral functions.

But it is specially in the muscular system that is manifested in the most remarkable manner that activity of nutrition; for the muscles acquire more volume, more density, more power, and in turn react upon the internal organs.

Active exercise practised in early life appears also to increase the nutrition of the osseous system. The muscular contractions develop the whole frame and increase the size of the eminences where the muscles are attached. To the muscular development is always joined that of the circulatory system, and from the well-being of the two apparatuses results a robust constitution, and one ordinarily exempt from infirmities.

To resume, then, active exercises exert first their influence on the muscles which execute the movements, and they increase afterwards the action and the energy of the assimilating organs, because the muscles requiring from these a greater amount of material proper to their development, double necessarily their work, and because they communicate also to the organs of nutrition agitations favorable to the execution of their functions and to the nutrition of tissue.

2. *Effects of passive exercises.*—These exercises take place without contraction of the muscles; the body,

then, is only submitted to agitations and concussions more or less great and frequent, which penetrate it, so to speak, and act upon all its parts. These motions stimulate the tissues, increase the organic activity, and render the execution of nutritive functions more easy. They do not excite, as is the case in great active exercises, disturbance in the digestion, circulation, or respiration ; they do not increase animal heat and perspiration ; they do not cause either loss or fatigue ; they are therefore suited to convalescents, and to individuals of weak constitution.

3. *Effects of mixed exercises.*—Mixed exercises, and specially horse-back riding, unite in themselves the advantages of active movements, and those of communicated or passive movements. They have on the muscles and on the viscera an action more powerful than the last, and that action has not, like the great muscular contractions, the inconvenience of bringing on great fatigue and an abundant loss of nutritive material ; thus the mixed exercises are almost suitable to all ages, to most temperaments, and, above all, to all individuals who by constitution are not strong enough to take great active exercises, yet have, however, need of more movement than simple gestation.

III

MECHANISM OF HORSE-BACK RIDING.

"I concede that walking is an immeasurably fine invention, of which old age ought constantly avail itself. But in some respects saddle leather is even preferable to sole leather.

"You may be sure that Bacon and Sydenham did not recommend it for nothing. One's hepar—or, in vulgar language, liver—a ponderous organ, weighing some three or four pounds, goes up and down like the dasher of a churn in the midst of other vital arrangements, at every step of a trotting horse. The brains also are shaken up like coppers in a money-box. . . . . .

"In all forms of active exercises, there are three powers simultaneously in action—the will, the muscles, and the intellect. In walking, the will and muscles are so accustomed to work together, and perform their duties with so little expenditure of force, that the intellect is left comparatively free. But in riding I have the additional pleasure of governing another will, and my muscles extend to tips of the animal's ears and to fore-hoofs, instead of stopping at feet and hands.

"Now in this extension of my volition and my physical frame into another animal, my tyrannical instincts and my desire for heroic strength are at once gratified. When the horse ceases to have a will of his own and his muscles require no special attention on your part, then you may live on horse-back as Wesley did, and write sermons or take naps, as you like. *The Autocrat*, 1858."

IN the act of horse-back riding, man follows the motions of the movable basis which supports him. Each time the animal upon which he sits alters its position, at the instant when its feet, carried forward, meet the soil and are thus forced to support the

weight of the body, a shock takes place—that is to say, that all the movements of impulse given to the body of the animal cause a displacement which is communicated to the rider.

These concussions are repeated at intervals more or less frequent, according to the rapidity of the movement of the animal, and they are more or less strong according to the gait of the latter, the nature of the soil, the quality of the horse, and the skill of the one who rides.

To proceed in order, we must next, aided by the excellent pages of Dr. Chassaigne (which he kindly placed at our service), examine the modifications which the different gaits of the animal exert on the movements communicated to the horseman.

All the movements of the horse which have progression for their object—and these are they which we are specially to consider—may be classed in three groups and are called natural gaits. They are the walk, the trot, and the gallop. All others, such as single-foot, Spanish step, ambling, cantering, hunting and racing gallops are the results of education or bad habits.

Walking is a natural gait, since the horse always rests on the ground. In it we distinguish four different measures or beats. In the *first*, we have the horse carried forward by raising and advancing the right fore-foot ; this is followed, at a very short interval, by the corresponding movement of the left

hind-foot, which constitutes the *second;* the *third* is seen in the raising and advancing of the left fore-foot, and the *fourth* in the same action in the right hind-foot ; but at the moment when the right hind-foot is about to touch the ground, the right fore-foot leaves it, and the hind-foot is placed in its track, or, in the case of some animals, a little in advance.

During these movements, there is a moment when two of the feet are raised from the ground, and the horse rests entirely on the other two, and as we have already shown that the second movement follows very closely upon the first, and that the left hind-foot is on the ground at the same moment, or very nearly so, as the right fore-foot, it follows that in this gait the horse is supported, now on two feet laterally, now on two feet diagonally.

Hence, in this gait the centre of gravity being but little or not at all changed, it is the easiest, the rider receiving only moderate concussions, repeated at distinct intervals, regular, easy to count. This is the only gait to ride immediately after meals, and should be restricted in certain diseases.

The *trot* is a diagonal and jumping gait. If we examine the movement of a horse which has just started, there is a point of time when, by the force gained, the horse is for a moment suspended in the air, all four of his feet having quitted the ground. He then falls on his right fore-foot at the same time that the left hind-foot touches the ground, in order

to acquire a fresh impulse, which throws the weight of the body on the left fore-foot and continues the movement by means of the right hind-foot. There are, therefore, but two measures or beats in the trot.

The rider receives at each movement rude shakings, which cause him often to rise in the saddle, and the violence of these varies singularly according to the nature of the ground, the habit one has of this mode of riding, and specially of the quality of the horse himself.

The *gallop* is a succession of leaps. The horse first raises the fore-part of his body, but his fore-feet do not both leave the ground at the same time. We will suppose the horse starts with the right leg, the left follows immediately, and he rests entirely on the hind-legs, which, bent like a bow, make a sudden spring. The body is thrown forward, and all four of the feet are off of the ground, but the shock falls on the two fore-feet, lessened by the manner in which they are placed upon the ground ; the left one, which quitted the ground last, being replaced first, the right following immediately, but a little in advance to support the left, and to divide the shock. During this time the two hind-feet are brought forward just under the centre of gravity and near the fore-feet, with the right foot a little in advance of the left ; there is, therefore, a moment when the four feet touch the ground. However, we observed that the hind-feet do not both quit the ground at the same mo-

ment, but one after the other, as the fore-feet do, and in this movement the right foot is raised and replaced a little in advance of the left, but the difference, in this pair at least, is almost insensible; therefore we may consider the gallop accomplished in three measures or *beats*.

The first is marked by the left fore-foot touching the ground, the second by the right, and the third by the fall of the two hind-feet. This cadence is so clearly perceptible that it may be musically measured. Every one perceives it, and even poets imitate it in the construction of their verses:

Quadrupedante putrem sonitu quatit ungula campum.

It is understood, of course, that if the horse starts from the left fore-foot instead of the right, the same movement takes place, but in inverse order.

In this gait the rider experiences only agreeable undulation. We speak in general, for there are horses whose gallop is more disagreeable than their trot, owing to certain peculiarities of structure or vices in the training.

Thus we see that the movements communicated by the horse to the rider vary, as we have said already, according to the gait, and also according to the animal and the nature of the soil gone over.

In walking, the cavalier follows the movement of the horse almost exactly, and retains the same position, but in trotting it is quite different. When the

horse throws himself forward on two feet placed diagonally he imparts to the rider an impulse which will be suddenly arrested when he comes down upon the other two. It is this sudden stop which causes the shock, the rebound which we all feel when trotting on horseback, however gentle it may be, and which is repeated at every step.

The direction of the movement which is communicated to us is the result of several forces.

First. It is proved that when two bodies move forward, one upon the other, the upper one always inclines to go beyond the perpendicular line.

Secondly. The forward movement of the horse takes the rider with it, and urges him in the same direction.

Thirdly. The shock is received at the point of support, while the weight in consequence of the velocity acquired acts always upon the upper portions of the body, and causes them to continue the forward movement.

Fourthly. In the act of leaping, the horse raises the body upward as well as forward, and the weight which causes it to fall again when the horse marks the second measure, that is, makes the second movement, still more increases the severity of the reaction. The result of all three forces combined is to urge the rider forward on the line of a slight curve.

In galloping, however, the movement is much more simple. It consists almost wholly of a series of

oscillations from before backwards, and the reverse, corresponding to the raising and falling motion of the horse.

The other gaits which a horse may be taught to take, or the precautions which may be necessary to avoid them, cause a number of special movements, into the details of which we cannot enter.

Every horse does not communicate absolutely the same movement, but the differences are entirely individual, and it was long since settled that certain varieties are particularly adapted to the saddle; and, lastly, the nature of the ground modifies the movement communicated, as, for example, a pavement, or extremely hard road, returns the whole force of the shock, while a softer and more elastic surface greatly lessens it, and on heavy ground the greater effort necessary on the part of the horse soon fatigues both him and his rider.

Now that we have explained the horse and his gaits, and the causes which may modify them, that we know, in a word, the movements which are communicated by him, let us see what active part the rider takes in horse-back riding.

As long as the horse remains motionless the rider has no movements to make which are peculiar to horse-back riding that we need to discuss here, but as soon as he moves the active *rôle* commences. The impulse received from the movement of the animal disturbs and changes his centre of gravity; he then

interferes to check this disturbance of his equilibrium, or recover it, if it be lost. Two forces contribute to these results: the proper management of the weight of the body and the muscular contraction. The centre of gravity, which is simply the point of union of the forces resulting from weight, contributes greatly to the firm maintenance of the seat, if it falls directly and vertically upon the saddle, but if it is greatly displaced, it includes the whole body, and increases the effect of the movement communicated to it.

In *walking*, which is a regular gait, this displacement is next to nothing; therefore we will not insist upon the inconsiderable movements caused by it, since all the active interference of the rider is confined to a small pressure of the knees determined by the adductor muscles of the thighs. Nevertheless the rider can scarcely avoid a slight swaying of the upper portions of the body against which the sacro-lumber and long dorsal muscles react, and hold back the spine and thorax and with them the centre of gravity from their constant tendency to fall forward.

This almost permanent contraction of the muscles brought into action—and which might be termed a state of active immobility, since its effect is to fix the points upon which it acts and maintain them in a quiet state—becomes fatiguing if kept up for any length of time.

The *trot* is of all gaits the one requiring the greatest number of movements on the part of the rider,

because it most disturbs the centre of gravity; but it is also, if we except the walk, the one which can be indulged in longest, by both horse and rider, because of the great number of muscles brought into action, and which seem to divide the labor and prevent fatigue from being felt as soon as when the number of muscles is smaller.

The reader may judge from this explanation of the communicated movements how complicated they are, and those executed by the rider himself are not less so, as the following analysis will show.

The rider sits on the saddle with his thighs firmly pressed against it, the knees also, though not too hardly, the leg free, with the foot resting in the stirrup in order to aid in supporting the knee, for on the fixity of the point of support furnished by the knee depends the solidity, as on the proper position of the body and the centre of gravity does the firmness of his seat. This pressure, which should be stronger than in walking, since the disturbance is greater, is effected as we have seen by the adductors of the thighs.

With the knees so fixed, the trunk no longer obeys the forward impulse, or at least the displacement in this direction is much diminished, and there is little more than slight vertical movement, from below upwards, which takes place when the ischium leaves the saddle to fall again by the force of gravity. This is not the case with the superior portions of the body,

head and thorax, which, endowed, so to speak, with movement independent of those of the trunk, seem to be subject to some foreign influence, though they have in fact received the same impulse, but transformed and exaggerated by the force of gravity acting most strongly upon the parts furthest removed from the trunk, and the more easily in proportion to their mobility.

This force when strongly applied may cause the fall of the rider, but when utilized and applied judiciously renders his seat firm and secure.

The sacro-lumbar and long dorsal muscles, by drawing the chest and head backwards, cause the centre of gravity to fall behind the perpendicular line, and oppose a certain resistance to its displacement forward. The strength of the muscular contraction, in order to effect this object, must be in proportion to the impulse imparted to the trunk.

In galloping, the rider is conscious only of an oscillation backwards and forwards alternately, and the flexors of the thigh, the psoas and sacro-lumbar muscles are especially called on to restore any considerable displacement, to recover the centre of gravity, whether it be thrown forwards or back, according to the need, while the adductors fix the knees.

We may in this way explain the theory of horse-back riding in reference to its mechanical action, and if from it we may infer that gravity contributes towards restoring the equilibrium which it has helped to de-

stroy, we see also that it is the muscular contraction which brings it, and that it also determines the fixedness of the points of support, and that the muscles are the agents of the movements.

But we should strangely deceive ourselves if we imagined that those muscles only act which have been named in studying the movements of the equestrian. There is not, perhaps, a single muscle which does not come into play in horse-back riding, either for preventing a displacement or restoring a disturbed equilibrium. It is not necessary for them all, however, to contract with the same energy, and while some, as the adductor muscles of the thigh, the sacro-lumbar and long dorsal muscles, may be termed essentials, others intervene only accidentally, as it were, or to meet certain exigencies, or produce special movements, as in the high school exercises, parades, etc.

Others are assistants merely of the muscles which we call essentials, and may be termed auxiliaries, and, lastly, we know that when a muscle causes a movement in a certain direction, there is always one or more the action of which is opposed to it, and which are therefore called antagonistic.

IV.

PHYSIOLOGICAL EFFECTS OF HORSE-BACK RIDING.

"How much wagon-driving 'granny'-fashion, with swathed legs, will give our young men's chests an inch in breadth, or add an ounce to their attenuated calves.

"If riding on horseback were the fashion, as it ought to be, New York parties would present less frequently the lamentable spectacle of cavaliers the same height and not half the breadth of their partners. The narrow-shouldered, lanky beaux who haunt our ball-rooms are standing appeals to the Park Commissioners to do any thing that in them lies to bring back amongst us the ancient and manly art of riding on horse-back. Nothing will do so much to toughen our muscles and inflate our lungs."

Hygiene, by F. H. HAMILTON, M.D., 1859.

HORSE-BACK riding is specially adapted to the physical development of man; its effects reach every function, but as they are each and all inseparably connected, no one of them can increase in energy without augmenting the action of the others. Thus horse-back riding rouses the weak ones, restores and maintains the equilibrium, and establishes harmony between all the physiological phenomena of life. In this lies its hygienic and therapeutic power.

In studying this part of our subject, we propose to examine successively the modifications caused by it in the exercise of each one of these functions, and naturally commence with the act which provokes all

others and which is the point of departure—that is, muscular contraction.

1. *Muscular contraction.*—The will commands, the muscle obeys and contracts. What is the agent of that contraction? No one doubts the contractile property of muscular fibre, but it is powerless without the intervention of an external influence, upon the nature of which physiologists have long disputed; some giving to nervous excitation an importance which it certainly does not deserve, while others make the blood play an exaggerated part.

All our present knowledge of this subject is admirably summed up in Gavarret's excellent work, "Les Phénomènes Physiques de la Vie." According to the learned professor, the closest possible connection exists between contractibility and the phenomena of combustion which takes place in the network of the capillaries of the muscles. In fact, when a muscular contraction is to be produced, the nervous action is confined, so to speak, simply to giving an impulsion to the muscle, thus preparing it for the action of another agent, the blood. The arterial blood flows into and abundantly fills the capillaries which permeate the muscle. The oxygen which it contains burns with fresh energy the combustible materials which it carries; these are the products of digestion, fatty and saccharine matter chiefly, with some of the proteine substances.

The result of these internal combustions is the

production of carbonic acid and water, and to these may be added azote, urea, or uric acid—which are derived from the complete or incomplete oxydization of the quaternary substances; and, lastly, heat is engendered. The carbonic acid, the azote, the water, urea and uric acid are carried away by the veins which spring from the muscle and eliminated from the circulation by the different emunctories of the system; but what becomes of the heat which is liberated by this combustion? The temperature of the muscle in which these chemical transformations are effected is raised, it is true, but this elevation of the temperature is far from being in proportion to the quantity of substance burned; but a new phenomenon is meanwhile produced: the muscle is contracted. This contraction of the muscle is of the greatest importance, since it balances a certain weight—it represents the result of a process which has absorbed the heat that has apparently disappeared. "Thus, while the muscle acts, the heat produced by the internal combustion divides itself into two complementary parts. One appears as sensible heat and regulates the temperature of the muscle; the other part, by the intervention of muscular contractility, is converted into mechanical force."

These phenomena invariably succeed each other, and they are the inevitable consequence one of the other. The chemical action takes place first and

produces the heat; then the fibres consume a portion of this heat, converting it into mechanical force.

A great number of facts support these propositions, and brilliant experiments corroborate them. It has been demonstrated that the temperature of a contracting muscle rises, that it absorbs more oxygen and exhales more carbonic acid when in action than when in repose, and, lastly, that the energy of the contractions is in direct proportion to the activity of the internal combustion. The real agent, therefore, of muscular contraction is the heat produced by the combustion, of which the muscles are the seat, resulting from the conflict between the blood and the nervous system. According to Mayer, "a muscle is simply an apparatus by which a conversion of forces is effected, but it is not the substance by the chemical change of which the mechanical effect is produced."

The contraction of the muscle, then, causes a fresh portion of the arterial blood to enter the organ in a far greater portion than would flow to it in a state of repose, and consequently the capillary circulation of the muscle is accelerated. The phenomena of combustion accomplished, the venous capillaries carry away this blood charged with the products of oxydization, while the contraction, the result of the chemical action, aids in the disgorgement of the muscle in order to give place to a fresh arterial flood which will produce a fresh contraction. Of all the products eliminated by this process carbonic acid is the most

important and most easily produced by experiments. It is evidently formed *in* the muscle, for the blood contains before entering it much less than is found after its exit, and it is formed *during* contraction, since after contraction the proportion is increased.

It has been found that the venous blood contains an average of 6·75 parts more of carbonic acid than the arterial, when the muscle is in a state of repose, and 10·79 when it is in a state of contraction.

If the action of the muscle is too long continued, the increased circulation in its substance is no longer sufficient to carry away the products of combustion, which goes on incessantly, so they accumulate in the muscle and a new product is formed there—lactic acid. Then the muscle loses its elasticity, its energy and precision ; movement becomes painful, combustion is less active, there is a decrease in power, and we have an exhibition of the phenomenon termed fatigue. Repose, by allowing the venous blood to carry the products injurious to the economy, by lessening the intensity of the combustion, which is the cause of the trouble, removes all these symptoms, which might be produced, on the other hand, in an animal in a state of repose, by a simple injection of lactic acid into the substance of the muscle.

This activity of the circulation has another object and effect, that of carrying to the organ a still larger quantity of nutritive matter, which it assimilates. It is shown by experiment that a muscle ex-

ercised regularly and moderately, increases in volume and in strength. At the same time, while gaining in size it improves in quality. The fibre has more tone, is more elastic, more patient, and more precise in its action. All these qualities are developed to their highest degree by horse-back riding. This is an incontestable fact which we may see proved every day by riders, who cause their horses to execute the most complicated movements often impossible to demonstrate ; when we see them attain, by force of habit, the power of continuing for long hours exercises which they could not endure for a tenth part of the time when first beginning the practice, and see them, though frail and delicate in appearance, endowed with the most surprising muscular energy.

Horse-back riding does not indeed develop such athletic forms as result from some gymnastic exercises. It brings a great number of muscles into action, sometimes simultaneously, sometimes successively ; it does not require great power in action, but, continued and often repeated, increasing according to its needs. It would be useless to produce large and powerful muscles were they not resistant and patient. Here the muscular fibre trains itself rather than grows.

Let us observe here, that the muscles which act directly in horse-back riding are not the only ones to participate in the advantages resulting from it. In those which act antagonistically the same tonicity is perceived ; they acquire *spring*, as it were.

Horse-back riding is therefore a general education of all the muscles much superior to that of fencing, for example, which includes that of only one member totally neglecting the other. This explains why the right arm is more developed than the left, in fencing masters and those who practice fencing much, and that the right shoulder is so much higher than the other—the passes and thrusts being more frequent with the right hand than with the left. On the other hand, the left leg is much more developed than the right, because upon it rests the whole weight of the body.

2. *Circulation.*—We have seen how the circulation of blood is accelerated in a muscle during contraction, and we have noted also the great number of muscles which participate in horse-back riding; it is not difficult, therefore, to conceive what an influence it might exert upon the phenomena of circulation. The impulse originating in the muscles extends to the whole circulatory apparatus, the blood moves everywhere with new force, the capillaries are invaded on every side by the torrent seeking an outlet, the swollen veins pour their surplus into the heart, the general commotion communicates itself to the central organ of the circulation, the venous blood is driven into the lungs, where it is exposed to the closest possible contact with the air, and there parts with its useless constituents, imbibing oxygen in their stead, and, impelled by a fresh wave, it hastens back

to the heart, from which it again at once departs to repair the losses which the arterial blood has suffered, and to cause a new muscular contraction. The whole system is in action, and the blood penetrates abundantly and fills the entire vascular system, where before it entered insufficiently and with difficulty.

It is interesting to study, first of all, the manner in which the blood acts in the capillaries. A knowledge of the facts will enable us to explain a number of phenomena which we shall notice further on.

In the structure of the vessels which form the continuations of the smaller arteries, muscular fibre predominates. The play of these fibres, which differ essentially in their anatomical elements from those which we have heretofore studied, is independent of the will. It is governed by a special system of nerves, springing from the grand sympathetic and also some of the spinal nerves—the vaso-motors—and according as these nerves are in action or inaction the capillaries contract and dilate. The fibre cells are not found in the minutest ramifications of these vessels, but they are replaced by an elastic tissue which follows the modifications of the muscular tissue and contracts or augments the calibre of the canals which it forms. Moral as well as physical impressions cause important modifications in the circulation of the capillaries. Every one is cognizant of the flush and the paleness which accompany anger or shame, pain or pleasure. But the vaso-motors are yet much more

sensitive to the influence of heat and cold. From cold the muscular fibre contracts and lessens the calibre of the vessels, the blood circulates less abundantly in their cavities; and paleness of the tissues which they traverse and a lower temperature are the consequences.

Heat, on the contrary, seems to paralyze these nerves, and the muscular fibre no longer reacts against the pressure from within, which, encountering less resistance, dilates the vessel just in proportion. The parts become red, swollen, gorged with blood, and the temperature is increased. It is specially on the surface and the extremities that we may observe these phenomena, because the medium in which we live is daily subjected to numerous influences which lower the temperature; it borrows, so to speak, from the heat of the body with which it comes in contact.

The slight conductibility of the human body preserves the internal organs from these daily losses, and the blood which renews itself continually maintains at the surface a relative warmth. But still the sensation of cold causes the contraction of the capillaries over the whole surface of the body, and the circulation is enfeebled just in proportion to the energy, and, per contra, it is frequently accelerated in the substance of the organs contained in the visceral cavities. If the cooling is slight, if the contraction in the capillaries is infinitesimal, there is only a slight increase of tension in the great arteries; but if the capillary net-work is

considerably contracted, the quantity of blood remaining the same, the arterial tension can only check the circulation to a certain extent, and for the double reason that the circulation is less active and the quantity of blood sent to the surface, where it would be cooled, smaller, its temperature rises, and this heat paralyzes the vaso-motors which govern the capillaries of the viscera; the calibre of these vessels perceptibly augments, and the organs which they permeate are gorged with blood. This is the ordinary cause of visceral congestions. Such at any rate is their fatal mechanism—and it is explained by the inertia of the vaso-motors.

We have already seen how muscular exercise increases and re-establishes the surface circulation by augmenting the internal combustion, and thus giving an impulse to the blood, accelerating its motion; and by raising the temperature of the surface of the body, all these influences combined triumph over the contracted vessels, they gradually relax, the blood re-enters, and with it heat. This process continues until the tension is equal or nearly so in all the capillaries of the body. The blood rushes into them and no longer gorges the viscera; these lose their congestion in consequence, the vaso-motors come out of their torpid condition in proportion as the heat circulates, instead of concentrating in the centres.

What we have just said concerning muscular exercise in general applies especially to horse-back riding, and

whether it removes congestion or causes the circulation to increase in parts which are anemic, it always favors the exercise of a function of the highest importance, since its deficiency in one case and its exaggeration in the other are the conditions from which morbid phenomena spring.

Haller says, "Equitatio parum pulsum auget neque calefacit." In fact, the heart beats more quickly from the quickened motion of the blood, and the pulse, which is the echo of the movement of the heart, marks the amount of the increase.

Nick gives his observations of the variations of the pulse caused by horse-back riding as follows: the rider at a walk has his pulse quickened from fifteen to twenty pulsations in a minute, and in trotting the increase is greater, amounting to forty-two beats a minute more than before the exercise.

In my researches on this subject, I arrived at nearly the same conclusions; I remarked also that the increase was greater in beginners than in those somewhat habituated to riding.

The pulse at the same time beats with more force, it is full and hard, and at first we think the arterial tension is augmented. It is well, however, to avoid falling into this error, as it might be of great importance in the therapeutic application we might be tempted to make of horse-back riding. Here, our senses are unfaithful, they deceive us. The sphygmometer of Marey reveals the true condition. The

instrument shows a diminution of arterial tension ; it could not be otherwise, for the blood in the great arterial trunks, finding less resistance from the dilated capillaries at the surface of the body, flows more freely. The result of this is less tension and less resistance to the ventricular contraction ; this is effected more brusquely, and the shock is perceived more distinctly by the finger. It is this instantaneousness—which does not affect the circulatory apparatus—which causes the apparent fulness of the pulse.

The second proposition of Haller is equally true—neque calefacit—but we must be careful to give it the meaning attached to it by its author. Struck by the increase of temperature which usually accompanies fever, the physicians of former times did not separate the idea of heat from that of fever, and the great physiologists, in adopting their language, have perpetuated their error. Horse-back riding certainly increases the temperature of the body, for we have shown that a portion of the heat produced by the combustion which takes place in the muscles is rendered sensible to thermoscopic measurement, but this heat is not fever. It is true that on dismounting, if the exercise has been somewhat prolonged, a slight trembling is felt in all the limbs ; at the same time the skin is rosy and moist, a gentle perspiration exuding from every pore, but instead of the suffering produced by fever there is a sense of comfort.

The increase of temperature is especially remarkable at the surface when it may be relatively high; but it is far from attaining the same degree in the central organs, it is there scarcely perceptible. The natural cavities are the parts to be examined, because their temperature approaches nearest to that of the internal organs. By taking the average of the results which have been furnished, we find:

Temperature of the axilla increased.....1°
" " mouth " .....0°.6

The elevation of temperature is less, the nearer we approach the centre, and it is probable that there the increase would not be more than one or two tenths of a degree.

These phenomena do not persist after the exercise has ceased, and the system returns after a certain time to its normal condition. The frequency of the pulse, however, is perceptible yet after half an hour of rest, and sometimes even longer.

3. *Respiration.*—Horse-back riding causes great differences in respiration, as well as in the circulation.

All gaits, however, do not have the same effect upon it. The walk, for example, affects it very slightly; with the trot and gallop it is far different. We have already seen the action of the diaphragm. Occupied in assisting the muscles of the abdominal walls to confine the viscera and repress their movements, shaken as they are by the shocks of the trot.

it cannot take a large part in the act of respiration. By its contraction, however, the thoracic cavity is enlarged and gives entrance to a greater quantity of air. The diaphragm takes part also to some extent, though passively, in the act of expiration. The viscera pass on to it the shock received by them at each measure of the trot, which it resists, thereby causing a slight relaxation of its fibres; from this follows a contraction in the thoracic cavity, and the expulsion of a certain quantity of air. It may also, when the motion of the horse is very gentle and the rider makes no muscular resistance, take a more active part in the respiration.

It is to the inspiratory muscles and to the fact that the respiration becomes costal, that the increased capacity of the lungs is due. The diaphragm being contracted and the ribs powerfully raised, the chest finds itself considerably dilated, and the air fully fills the lungs. By the relaxation of the muscles, the ribs descend, the capacity of the lungs is diminished, and the vitiated air which they contained escapes.

But it is possible to produce a contrary effect. The violent reaction of the trot of certain animals causes the whole mass of the abdominal viscera to be thrust forcibly against the diaphragm, thereby brusquely expelling the air from the lungs. Respiration then becomes painful and synchronous with the gait of the horse, each expiration being short and sonorous. The inspiratory muscles are in a state of per-

manent contraction, keeping the ribs constantly raised and scarcely yielding to the weight of the chest, which at every shock, acted upon by gravity, slightly falls. This condition causes an effort which cannot be kept up long, and symptoms of intoxication caused by the carbonic acid gas soon make their appearance ; for in this case the change of air which should be effected in the lungs is much less complete than when the inspirations are large and deep, and fatigue soon supervenes. It was to soften the shock and avoid these inconveniences that the English way of rising in the saddle was introduced, which makes the riding a hard trotting horse less tiresome.

In a rapid gallop, another phenomenon presents itself—the difficulty of respiration. This is explained by the greater pressure on the air contained in the thoracic cavity, thereby requiring greater efforts for expiration ; and it is to break this external pressure, which, confining the air in the chest, hinders its exit, that jockeys lean over their horse's neck and wear large visors on their caps.

In studying muscular contraction, we have seen the blood which brings the fuel for combustion load itself with the carbonic acid and the vapor of water produced by the oxydization of the ternary substances. These gases, if left to accumulate in the blood, immediately become an obstacle to the performance of its functions ; the veins collect this blood which has lost its virtue and become useless, and carry it to the

different emunctories, where it is purified, and to the lungs, where it is endowed with a new life. But by this act of muscular exercise the proportion of hurtful principles has increased, the need of active elements is still greater, that which was before sufficient to meet the demand is now too little, and the activity of the respiratory phenomena should correspond with the respiratory. The surface of contact between the blood and the air has enlarged, the number of respiratory movements has increased, the air expired contains more carbonic acid than when in a state of repose, and it has at the same time lost a greater quantity of oxygen, and it retains a larger amount of azote which is derived from the combustion of the quaternary substances, and this exaggeration of the respiratory phenomena has a limit. If the internal combustion is always effected with the same intensity, the moment comes when the circulation is no longer able to carry away the products of combustion which accumulate in the muscle, and end by hindering the chemical action; at the same time bringing with it that peculiar sensation known as fatigue. The phenomena do not cease here, for if the exercise is prolonged beyond reason, the carbonic acid does not all escape through the lungs; a certain quantity remains in the blood which returns to the heart, and mingling with the arterial blood, produces the accidents which we call cephalalgia, dyspnœa, etc.

It is easy to explain the activity of the respiration while riding. The normal number of respirations in a minute is set down at 18 in the adult, but I have found it to be 28 to 32 after a fifteen-minute French trot. The English trot produces a little smaller result. Under certain particular conditions, the number has risen to 55 in a minute. In a very rapid gait the respiration becomes short and frequent.

Mr. Smith has thus tabulated the effect of muscular exercise upon the quantity of air which enters the lungs at each respiratory movement :

Lying down	1·00
Standing	1·38
Walking (a mile an hour)	1·90
Riding (at a walk)	2·20
Walking (two miles an hour)	2·76
Riding (at a gallop)	3·16
Riding (at a trot)	4·05
Swimming	4·32
Running (seven miles an hour)	7·00

If it is conceded that a man takes half a litre of air into his lungs at each inspiration when at rest, he would take nearly double as much when walking his horse—or one litre ; two when trotting ; but in a gallop, when the reaction is a little less than trotting, he would take one and a half. Enlargement of the thoracic cavity is often observed in horsemen ; this

peculiarity which predisposes to hæmatosis, is, according to Woillez, to be attributed rather to the action of the general muscular system than to the muscles of the thorax or those of the upper portions of the body.

And, lastly, there is a phenomenon which cannot justly be separated from respiration; it is the cutaneous exhalation, which is sensibly affected by horse-back riding. In fact, the increase of the surface circulation, by bringing to it a greater quantity of blood, favors cutaneous respiration. The evaporation of the vapor of water and the exhalation of carbonic acid are increased, and more oxygen is absorbed by the skin. As we have already remarked concerning the circulation, respiration becomes gradually normal with repose.

4. *Nervous influence.*—If ever a subject has been much discussed, much experimented and written upon, it is certainly that which treats of nervous action. What is its nature, its function, and how does it act? These are the questions we are still led to ask, for if light has been thrown upon some points, there are others which still remain in darkness.

Physiology shows us the arterial blood penetrating the organs, and there undergoing a transformation into venous blood, and by this change performing a work in relation with the parts to which it penetrates. We have shown that the chemical action produces the

contraction which has for its result a mechanical force, and we shall demonstrate that the same thing takes place in the nervous system ; and that it causes nervous action. But while the muscular action is transformed into an external force, the nervous action exhausts itself entirely in the interior of the economy, and reduces itself to a simple intervention in the functions of the organs which it animates.

The arterial blood, red and rich in oxygen, penetrates the nervous system, while the venous blood comes out of it black and charged with carbonic acid. This incontestable fact alone proves that in a state of repose the organic materials of the blood burn in the capillaries of the nerves and nervous centres, as it does in the vascular net-work of all the tissues of the organism.

When the nervous action is violent, as in anger, or when the action is long continued, as in study, there is an increase of the temperature of the body, and as in muscular contraction, the nervous system when in action absorbs oxygen and exhales carbonic acid; it becomes fatigued and gives an acid reaction. It is easy to convince ourself that after severe brain-work, the proportion of urea in the urine is greatly increased.

Schiff remarks that when a nerve has been excited from any cause, the propagation of this excitement is accompanied by an appreciable elevation of temperature along the course of the nerve.

Vulpian has shown that the nervous fibre has a peculiar action which he calls *neurility*. According to this author, the action of the nervous cell takes place only under the influence of the neurility of the fibre, and the nervous centres lose all their activity as soon as they cease to receive arterial blood. Nervous power is the result of the action of the blood on the brain and spinal marrow.

The same writer says again, we are led to the inevitable conclusion that neurility is the distinct fundamental independent physiological attribute of the nervous fibre, and that the existence of this property is inseparable from the integrity of the structure and nutrition of the anatomical elements.

Gavarret thus explains the nervous action: "Like the muscular fibre during contraction, the nervous fibre under a direct excitant, or when propagating some communicated excitement, is perceptibly increased in heat. In the nervous as in the muscular system, this momentary elevation of temperature is in reality perhaps nothing more than the result of the momentary increase of internal combustion. In view of these facts, we cannot but recognize that neurility and muscular contractility have the same relation to heat. The activity of the nervous system and the intensity of the internal combustion correspond to each other and increase and diminish together. In the nervous centres the result of combustion is transformed into neurility, the different nervous filaments

collect this neurility, and, dispersed in all directions, it goes to increase the activity of the different organs of the system; . . . . thus in the animal there are three dynamic manifestations, the production of heat, muscular contraction, and nervous activity, which are derived directly from the action of the oxygen of the air upon the organic materials of the blood."

The nervous action simply gives the impulse to the phenomena of combustion; once commenced, the action of the oxygen upon the materials of the blood continues and produces an effect out of proportion with the primitive expenditure of the impulsive force.

How can we refuse to recognize the immense influence that the circulation exercises over the production of nervous phenomena?

Then comes the question, if there does exist so intimate a relation between these two functions, circulation and innervation, within what limits are they exercised, and in what proportion does the disturbance of one react upon the other? However, what seems incontestable is that the nervous tissue is subject to the same laws as the other tissues of the organism; like them, it is nourished, expands, and is regenerated. The blood is the agent of these transformations, and the circulation is effected in them in the same manner as everywhere else, is subject to the same modifying causes. The integrity of this function depends upon the integrity of the nervous ac-

tion. But if for a reason which it may be difficult to explain, the nutrition of the anatomical elements is insufficient, or the circulation is not normal, whether there is anæmia or hyperæmia of the nervous substances, these dynamic disturbances appear as nervous disturbances, which often constitute a pathological condition.

Horse-back riding, as we have seen, is one of the most energetic modifiers of the circulation; it distributes the blood equally to every part of the capillary net-work, giving to each part its due proportion, by maintaining a due tension in every part, by equalizing the temperature; it prevents equally anæmia and hyperæmia, and sanguineous stagnation, by the impulsion which it gives to the circulatory phenomena, and aids nutrition by the acceleration of the respiratory and digestive phenomena. It is by its effect upon the reactions of the blood to the nervous system that horse-back riding produces such a happy influence.

5. *Digestion.*—The effect of horse-back riding upon the functions of the system, is especially remarkable upon that of digestion. It stimulates the appetite—excites and perfects digestion, favors absorption—in fact, to use a trivial expression, "it makes the bits go down." These are not the only results of the new energy imparted to the functions which we have studied, and all of which concur in the accomplishment of this special one; it exercises a

special influence upon the muscular fibre of the coats of the stomach and the intestines. These viscera may be considered as fairly suspended in the abdominal cavity where they are barely held and limited in their movements by the folds of the peritoneum. Each shock from the horse shakes them and makes them to roll as it were upon each other, and causes the changes in the relations of the convolutions of the intestines. These shocks and knocks and rubbings act as a mechanical excitant upon the muscular fibre, which in consequence contracts with more energy, preserving, however, the peculiar character of the fibre-cells—that is, of contracting slowly and successively; the action of the fibre being increased and the peristaltic contractions acquiring more power, there results from it a more intimate mixture of the juices and aliments in the stomach, a more perfect chymification of the food, and a more prompt and complete absorption of matters already digested; and, lastly, all those which have as yet escaped the process are brought into the portions of the intestines where their metamorphosis is effected. The stomach emptied of food calls for a new supply; hunger reminds us of this need, while a sensation of weight in the anal region precedes defecation, an act by which the remnants of the preceding digestion are expelled, in order to give place to a new portion of matter which may have in part escaped the digestive process. The contractions of the great intestines by accelerat-

ing the natural movement of its contents greatly favor defecation.

But the mechanical excitement of the muscular fibres would soon exhaust its contractility if the natural physiological agent, the blood, did not come to its assistance. Every thing, in fact, combines to cause it to flow into the alimentary canal—the presence of food, the increased activity of the circulation caused by riding, the contraction due to the mechanical excitement in the fibre cellule, and fed by combustion. At the same time the glands, and the entire secretory apparatus depending on digestion, gorged with blood, furnish abundant material for their portion of the work, and lead powerfully with the muscular contractions in the elaboration of the materials for new tissues.

The blood which enters the stomach penetrates also the nerves which control it, and checks the fantasies of this capricious organ.

The increased circulation has another effect, that of promoting the venous absorption; and the greater pressure on the chyme in the alimentary canal, in consequence of the contraction of the muscular fibre, greatly favors its passage into the chyliferous vessels.

When the mechanical excitement of riding, like that of the will, causes the fibre-cell to act, it acquires more tonicity, the contractions cease to be languid and furnish more effective aid to the work of digestion. The effect of riding upon this last differs ac-

cording as the exercise is taken before or after eating.

In fact, if we ride when the stomach is empty, or nearly so—for the organ is never absolutely in a state of vacuity—the intestinal digestion is materially slackened, and the exercise would hasten the transformation and absorption of the substances which might be in the stomach intestine, and induce hunger. But if we ride immediately after eating, the diaphragm and the abdominal muscles would compress the intestines and the stomach, and might induce vomiting, or at least regurgitation, while at the end of an hour or two the fulness of the stomach would be relieved and no inconvenience felt.

6. *Nutrition.*—The nutrition of the individual, the consequence, nay, more, the object of all the other functions which we have examined, is at once the cause and the effect of all the physiological functions. The impairment of any one of them reacts upon this as the execution of the functions depends upon anatomical elements.

The blood which circulates in the vessels is the agent of all nutrition. It is composed of two parts: the one fluid, the plasma, containing the albuminoid substances, the products of digestion; this alone is capable of traversing the walls of the capillaries, and placing itself in direct contact with the tissues; the other is solid, in the form of globules, and, by reason of its bulk, could not pass through the vessels: both

concur equally in producing the phenomenon of nutrition, but in different manner. The plasma consists principally of water, which serves as a vehicle for the albumen and fibrin, and combines with the anatomical elements of the tissues, incarnates itself, so to speak, and is metamorphosed with the elements which it has just regenerated. It is thus that musculine, nervine, osseine, chondrine, etc., are formed, all derived from the albumen and fibrin, transformed by fixing of a certain quantity of the equivalents of oxygen and hydrogen in the proportions of water. In the same way the saccharine matter in solution, fatty matters in emulsion and mineral substances in the form of salts in solution, pass through the walls of the capillaries, and are carried wherever they are required. The organized materials of the tissues, on their part, are subjected to oxidation from the oxygen exhaled from the vessels with the plasma, an oxidation more or less complete, which transforms them, renders them unfit to do their duty, and they return to the circulatory mass, and are carried by the veins to the different emunctories to be eliminated in the form of creatine, urea, uric acid, choleic acid, etc. Such is the process of assimilation and elimination which takes place in the tissues, and it is active just in proportion to the circulation it augments or diminishes. It is particularly in the muscles that this incontestable fact may be seen.

It is in the rich vascular net-work of the circulatory

apparatus that the phenomena peculiar to them are subject to considerable exaggerations in order to supply the combustion rendered necessary by the contractions, though in such cases assimilation is carried on faster than the waste, and the muscle is better nourished when active than when in repose. This explains the development of the muscles under the influence of exercise.

The protean substances are not intended only to supply the materials necessary for the renewal of the tissues; they do not penetrate to every part of the vascular net-work; a certain portion remains in the vessels which has another destination. "The albuminous aliments play a double action in the economy; when once introduced into the circulation, they divide into two portions: one is assimilated and serves to renew the tissues, and the other is burned with the fatty and saccharine matters of the blood. These internal combustions produce a reserve force which furnishes the sensible heat necessary to maintain the temperature of the body, and the heat which is transformed into muscular power." (Gavarret.)

The blood, which incessantly loses in the processes of nutrition, combustion, and secretion, is regenerated by the products of digestion which are being constantly poured into its mass by the veins and the thoracic canal, and the activity of nutrition therefore keeps pace with that of digestion.

The red globules play an important part in the

phenomenon of nutrition. It is generally admitted that they are formed in the vessels of all parts of the system. They are born, live, and die there. The albuminoid substances introduced into the blood by the digestive process first undergo a transformation by passing into the globular state, and then they form a new anatomical element, the globule which is nourished like the others and is the seat of the double process of assimilation and separation. Whether it is destroyed in the physiological state is not known, but under certain special pathologic conditions—hibernation, for example—it evidently disappears. Suspended in the plasma in immediate contact with the albuminoid substances and the oxygen which they draw from the lungs, the globules are in the conditions best adapted for the most perfect nutrition. But in proportion as they assimilate, they also disintegrate ; and fibrin, the first degree of oxidation of the albumen, is the result of this separation. It is this fibrin engendered by the globules, dissolved by the albuminous fluid, which exhales from the vessels and goes to renovate the tissues.

Physiologists have long recognized in the globules the property of fixing oxygen. This gas seems to be condensed in the globules, as it gives the same reaction as ozone, which is nothing but condensed oxygen. It is this oxygen which gives to the globules their bright red color ; it is the oxygen which, by combining with the albuminous substances, transforms them into

fibrin ; it is it also which burns the hydro-carbonated saccharine and fatty matters of the blood, maintaining the animalhe at, engendering nervous action, and causing movement. But when it has furnished all these oxidations, where it is replaced in the blood by the products of combustion which dissolve themselves in the serum, taking the natural forms—water, azote, or in the form of salts—carbonates, the globules become dark red in color, and wither until they come in contact with the air in the lungs, when they seem to live again by charging themselves with oxygen.

We can see the importance of these red globules of the blood ; they are the soul of nutrition, since they engender the fibrin, which is the element of a great number of the tissues, and store up the oxygen, which is the agent of all combustions. In a state of health, their number is nearly uniform, but under certain morbid influences it considerably diminishes ; they are destroyed and not renewed. Then nutrition is insufficient. But of these two phenomena, which is cause or which is effect, whether the failure is in the nutrition or in the globules, we cannot tell ; they are sure to accompany each other.

When we see the muscular contractions caused by horse-back exercise give the impulse to the circulatory phenomena, and thence to the respiratory and digestive ; when we see the chest expand and inspire two litres of air instead of one half of one, the increased amount of food, the development of the mus-

cles, etc., how can we refuse to admit that the red globules—these other anatomical elements which are in most favorable conditions for nutrition—also feed and assimilate, and if in certain cases their number is insufficient for the needs of the system, that new ones are formed and their proportion increased?

We have already had occasion to refer to the *rôle* filled by the hydro-carbonaceous elements of the food, as well as the saccharine and fatty matter; those which in no way serve for the support or reparation of the tissues of which they form a constituent part are burned by the oxygen, in order to produce heat and movement. If these aliments are in excess, this excess is retained in the system, and the cellular tissue is fixed upon whenever it is found as the place of deposit, and thus *adipose tissue* is formed; the saccharine as well as fatty matters taking part in its formation. But this tissue has not its own proper life; when once formed, it remains as it is, is not assimilated, nor does it disintegrate; it increases or diminishes by juxtaposition or consumption, according to circumstances; it is a sort of reserve which is drawn upon to supply insufficient alimentation and to establish a kind of balance between the phenomena of nutrition and waste. It is easy to conceive the variable influence which horse-back riding might exert upon the production of this tissue, according to the expenditure of force which it might require and

the quantity of elements furnished to the internal combustion.

7. *Secretion.*—Horse-back riding does not exert a special and direct influence upon the secretions; their activity is often only the consequence of the activity of other physiological functions, and as they do not concern our therapeutics, we will pass them with a simple mention. Perspiration is the result of increased surface circulation, and increases or diminishes with it. Trotting induces it more than any other gait in riding.

The mouth becomes dry in horse-back exercise, in consequence of the rapid evaporation caused by the frequent passage of the air through the buccal cavity, due to the acceleration of the respiration. The salivary glands are not excited as in mastication, and no longer furnish sufficient saliva. As for the secretions of the glands of the stomach and intestines, of the liver and the pancreas, they regulate themselves according to the needs of the digestion.

The activity of the cutaneous and pulmonary exhalation, the increase of perspiration and fluid secretions in general, decrease in proportion to the quantity of fluid eliminated by the kidneys. As to the urea which they contain, numerous experiments tend to show that muscular exercise, even when carried to excess, does not materially increase or diminish it. The presence of free azote in the expired air explains this fact, as this gas is the result of the complete

combustion of the azotic substances, while the urea is the product of incomplete combustion, as the uric acid which always diminishes by exercise and increases from inaction. These phenomena are, indeed, in perfect ratio to the activity of the internal combustion, of which they are but the consequence.

The excitement of the muscular fibre of the bladder by the shocks resulting of the motion of the horse causes its contraction, and if it contains a certain quantity of fluid, the desire for micturition soon makes itself felt. Horse-back riding provokes it.*

* De l'équitation. Chassaigne. Paris, 1870.

V.

THERAPEUTIC EFFECTS OF HORSE-BACK RIDING.

Mr. Budgell, in *The Spectator*, 1711, writes : " For my own part, I intend to hunt twice a week, during my stay with Sir Roger, and shall prescribe the moderate use of this exercise to all my country friends as the best kind of physic for mending a bad constitution and preserving a good one.

" I cannot do this better than out of the following lines of Dryden's —Cymon and Iphigenia :

" ' The first physicians by debauch were made ;
Excess began, and Sloth sustains the trade.
By chase, our long-lived fathers earned their food ;
Toil strung the nerves and purified the blood :
But we, their sons, a pampered race of men,
Are dwindled down to threescore years and ten.
Better to hunt in fields for health unbought
Than fee the doctor for a nauseous draught.
The wise for cure on exercise depend :
God never made his work for man to mend.' "

LET us now study the relations of horse-back riding to the general health and to certain diseased conditions of the system. That it can aid greatly in re-establishing the general health and curing disease, is easy not only of comprehension, but of demonstration. If—and this we have already proved—this exercise be capable of increasing the activity of the organs of nutrition, of diminishing both the tendency to a plethoric condition itself, of aiding the excretion of

superfluous or extraneous material, and tending to remove, by increasing the activity of the viscera, bodies which obstruct them, it must be a powerful remedy.

Both reason and practical experiment demonstrate in the most complete manner that the efficacy of the substances employed by the physician consists above all things in this : that these substances possess the power either of calming super-excited or disordered functions, or of increasing the activity of those organs that perform their functions incompletely or too tardily.

The most efficacious and reliable medicines are, it is well known, those which influence the circulation and excite moderate action of the skin (perspiration). The knowledge of this fact is so general, that the farmer, when his horse is stiff from work or cold, does not permit him to rest, but exercises him until a moderate degree of sweating is produced.

The effects produced by horse-back riding of course vary, and should be graduated or adapted to the wants of the economy or the requirements of the disease : the walk, the trot, the gallop, as we have previously learned, affect the system in different ways and degrees, as do the amount and character of the exercise.

Some horses are far harder to ride than others, both temper and manner of moving influencing this ; the mode of riding, the habits of the rider, and the

exercises in which he indulges, will all strongly modify the effect produced on the system.

The results derived from horse-back riding are therefore dependent upon and modified by the pace, the duration and character of the exercise, the nature and gait of the horse, the method of riding, and habits of the rider.

General Diseases.

1. Morbid states of the blood.

a. Plethora (excessive fulness of blood).—This condition, seemingly intermediate between health and disease, consists in either an excessive amount of blood or a superabundance of red globules—the quantity being normal—that is an over-richness.

It is recognized by the redness of the face, caused by the distension of the capillaries, especially those of the cheeks, lips, and mucous membranes, by the strong resistant pulse and the turgid condition of the veins. It is often accompanied by loss of appetite, constipation, a tendency to hemorrhages and congestions, and a state of indolence and lassitude. Its causes are to be found in, first, a too great activity of the nutritive functions, aided by too free a mode of living, and, second, in the want of sufficient exercise.

While physicians are at variance respecting the special treatment to be adopted in these cases, they

nevertheless all concur in recommending a less nutritious diet and *exercise*.

b. Anæmia (poverty of blood).—The etymological signification of this term does not accurately describe the condition, for we do not mean a total absence of blood, but a lowering of its quality, a decrease in the proportion of the red globules. This condition is caused by insufficient quality or quantity of food, by defective nutrition, by loss of blood, by too severe or too long continued mental occupation, or by chronic diseases.

The decrease in the number of the red corpuscles in the blood lessens the power of this fluid to carry oxygen, and accompanied, as this disease very often is, by a diminution of the albumen of the blood, interferes with the transformations which are necessary to the conservation of the human economy. The development of tissue is diminished, the animal heat decreased, and the energy of both nervous and muscular systems lessened.

c. Chlorosis (green sickness).—Though it may be regarded as a peculiar form of anæmia, has a well-marked idiopathic character, in that it very often arises without appreciable cause. It has been regarded by many as an affection of the nervous system, having its origin or seat in the sympathetic, but it is more probable that the nervous affection is an effect, not the cause; that the nervous system is equally affected with the other organs of the body.

Observation proves that any thing tending to interfere with or disturb the nutritive function aids in developing any tendency which may exist to chlorosis. If we add to the remedies usually and properly given, iron, bitter tonics, nourishing food, etc., etc., the aid which may be derived from horse-back riding, may we not hope to cure in a short time an affection which if left to run its course will inevitably produce profound and irremediable ravages in the system?

d. Cachexia.—Here seems a fit place to say a few words upon a subject to which a proper amount of attention appears not to have been directed, but which is quite important.

However severely we may judge Galen, Borden, or the others who have multiplied beyond measure, and without reason, the varieties of cachexia, we cannot deny their existence or their influence, following, as they do, certain chronic maladies, which impress profound modifications upon the economy.

It is unnecessary to examine in detail each form, but it will suffice to simply name the commoner ones, of whose existence there can be no doubt. They are the paludean, the syphilitic, the mercuric, and the scorbutic. In each of these, this exercise strikes at once at the one element common to all, that state or condition of languor or inertia of all the functions which is the chief characteristic of the disease—a condition which persists long after removal of the disease which caused it.

We are all aware of the great difficulty of removing this cachectic taint from the system when its origin has been miasmatic, as in fever and ague, for example.

All is not done when the disease itself has been met and overcome ; the harder task of reanimating the disordered functions, especially the assimilative, yet remains, for without this the sufferer cannot regain his lost health and strength.

This is one of the cases in which we truly believe that, by suitable equestrian exercise, we shall see convalescence go on with a rapidity almost impossible without the aid of this powerful auxiliary.

c. Lymphatism (scrofula).—Lymphatism is the neutral ground between the lymphatic temperament, which is proposed as a normal type of health, and its morbid perversion, which constitutes the scrofulous diathesis. Although we are ignorant of the real nature of this condition, we recognize as its characteristic features a slowness and incompleteness of the functions of innervation and hematose, and a want of contractile power in the muscular and other tissues, which impress upon strumous patients a distinct and unmistakable character.

Although the relation between the lymphatic temperament, and the existence in persons of such temperament of strumous tendencies, is not yet fully understood, yet clinical experience teaches us that scrofulous affections once developed in lymphatic in-

dividuals not only run a more rapid course, but present symptoms of greater intensity, and are more rebellious to treatment than when they occur in people of other temperaments.

Besides this hereditary disposition, scrofula may be induced (how we know not) by causes such as excesses, privation, deficiency of fresh air, light, or exercise.

From whatever cause it may have been produced, our reliance is in dietetic and hygienic measures, and the providing of plenty of fresh air, light, and exercise, and these can scarcely be acquired in a pleasanter or easier manner than by horse-back riding.

f. Rachitis.—Rachitis, a disease common to childhood, is characterized by a tendency to a softening of the osseous or bony tissues, or rather to a non-deposition of the earthy constituents in the bone, and an alteration in the nutritive function.

It is a disease that of itself does not kill, but is not on that account to be less feared.

Deficiency of stature, deformity of the lower extremities, curvature of the spine, a vicious conformation of the chest, early loss of the teeth, and a premature appearance of old age, which but too often affect the children of the wealthy, are its offspring.

The pelvis in rachitic women is often deformed, so that a natural confinement, if not absolutely impos-

sible, is but too often fatal to the child and dangerous to the mother.

In our struggle against the march of this disease, we employ every possible means to aid nutrition and assimilation. Diet, air, light, judicious and moderate exercise, are all necessary.

"Horse-back riding," says Chassaigne, "claims this privilege with more than one reason; we have already seen how it acts in the accomplishment of the phenomena of nutrition; we have also seen with what activity the transformation of the products of digestion into the tissues of the body takes place under its influence; we have seen how the mineral constituents of the food fix themselves in the bone when needed."

But this is not the limit of its useful influence. It stimulates the function of digestion, aids in a greater elaboration of its products, and requiring work from the muscles, develops them and necessitates their more solid attachment to the bones. The latter are also enlarged and strengthened, for as the muscles develop the prominences on the bones to which the muscles are attached are increased in size.

The converse of this is also true, for when, in certain diseases of childhood, the muscles are not used, the growth of the bones is often diminished, and sometimes even arrested.

The tendency to a contraction of the chest is directly opposed by the fuller breathing which this

exercise requires; and where an inward curvature of the thigh bone is threatened, the tendency is lessened by the action of the muscles in riding, and if the limb be not straightened, at least a certain resistance is opposed to the deviation.

g. Syphilis.—It may at the first glance seem strange that a sufferer from this disease, possessing, as it does, a well-marked specific character, can be benefited by horse-back riding. Nothing is more true, however; and since the question is both a delicate and serious one, we will give, as briefly and clearly as we can, our reasons.

According to Fleury, that, "As in any ordinary poisoning, the physician seeks not only to administer an antidote, but to cast out of the body, by the evacuations, the greatest possible quantity of the noxious substance, so in syphilitic infection the aim of the physician should not be alone directed toward the virus situated in the infected blood, but he should also strive to expel the poison through the various *eliminatorics* of the system."

Every now and then cases are met with which, in consequence of constitutional idiosyncrasies or the late hour at which the treatment is begun, or sometimes owing to its being badly directed, stubbornly resist all specific remedies. The disease persistently increases in severity, the symptoms multiply, and, above all, tend to become permanent, and, finally, a

true cachexia is developed, whose termination is but too often the grave.

Sometimes the venereal poison at the very outset produces a change in the blood, the proportion of the red globules being decreased while the water is increased. In a more advanced stage of the disease, the anæmia may be the result partly of the disease and partly of the prolonged action of the medicines employed ; the functions of the skin may be seriously interfered with if the eruption be very severe ; the strength may be exhausted by profuse salivation, or insomnia may be produced by the violent nocturnal pains which sometimes accompany this disease.

In all these conditions, the anæmia manifests itself by its characteristic symptoms, and it becomes absolutely necessary to aid the forces of the organism.

There is sometimes a stage of this disease which varies greatly as to the time at which it appears, where the poison seems to exert almost all its power in the production of gummy tumors or a diffused sclerosis. These growths may invade any part or organ of the body, and, developing in the meshes of any tissue, may either, by mechanical pressure or by replacing the normal tissue, interfere with or entirely suppress the function of the part invaded.

The danger to be feared from these growths is dependent in a great measure upon their situation, those affecting the viscera or nervous centres being much more grave than when developed elsewhere.

When the nervous mechanism is invaded, the utmost attention and care is requisite on the part of the physician, since symptoms almost inappreciable are oftentimes the most precious indications to the observer. The progress of the disease may be so slow and insidious as to deceive the vigilance of the most careful physician. Very often the sufferer from this disease cannot account for the gradual loss of both mental and physical power and of weight.

If these are accompanied by functional disorders, especially nervous ones, which may be slight and of short duration, the sufferer is led to believe that there exists no cause for uneasiness, when in fact they are potent indications of a most serious and grave condition.

The physician is seldom called upon until the lesions are of a pronounced character. If by a fortunate chance he is called upon in time, he may foresee their possible development, and take effectual measures to prevent it.

It is in the latter cases, when there yet remains in the organism some power of resistance, that horseback riding, in addition to the proper specific remedies, will be of great service; we do not presume to say in attacking the disease itself, but in placing the economy in such a condition that it can resist ulterior attacks, and the physiological may overcome the pathological state.

h. Gout.—Gout is an anomaly of the organism

under whose influence pathological conditions of the system of a determinate character are produced.

Scudamore regards gout as the result of the dietetic habit of the individual, and says that: "Any condition or occupation which leads to inactivity and repletion, or in which one only takes passive exercise, leads to gout."

With us here, however, the question is not as to the nature and causes of the disease—since its symptoms are characteristic, and but too well known—but how are we to prevent another attack?

The experience of every day confirms the truth of the statement that active exercise prevents gout. We know that laboring men rarely suffer from this disease unless there be in them an hereditary disposition.

The treatment of a gouty patient in the interval between the attacks, whether they be regular or irregular, must of course be chiefly dietetic; the instances are not few where men of strong will, men masters of, not slaves to their appetites, having been warned by one attack, have thenceforward resolutely abstained from rich living and strong drink of all kinds, and have been rewarded for their self-denial and prudence, if not by complete immunity from all further assaults, at least by very few and feeble visitations; on the other hand, there are many who, possessing a gouty tendency, know only too well, from personal experience, that a single debauch, or

sometimes a single glass of wine, or the excessive indulgence in animal food may lay them prostrate in the grasp of their enemy.

I am sure that total abstinence will well repay any young man who has any tendency to this disease, for any supposed privation.

With the old, however, the case is different, and this is especially so when the health has been broken down by disease. They must be allowed daily a certain quantity of their accustomed good cheer, or they become an easier prey to their enemy. Here we must venture as well as we can between the opposite dangers, between the Scylla of excess and the Charybdis of abstinence and debility.

The same is true in regard to exercise: the young and hearty can scarcely take too much; the old and debilitated may, by once over-exerting himself, bring on an attack.

"Although I can do little more than point out general principles for your guidance, I may remark, in reference to exercise, that it should never be violent, that it should be habitual, daily—not used by fits and starts, and interrupted by fits of indolence or inaction; and that it should be active, muscular exercise, as distinguished from passive exercise or gestation. No mode of exercise is as good as walking, and with this may be agreeably and beneficially conjoined riding on horse-back." (Watson, "Practice of Physic.") Sydenham, in his "Tractatus de Podagr. et Hydrop."

(1683), says of exercise in this disease: "Exercise practised daily and long continued prevents this misfortune, by dissipating with the sweat the humor of the gout; as to the exercise to be chosen, *horse-back riding* is preferable to all others, when the sufferer is not too aged, and has not the stone. And, indeed, I have long thought that were a man to discover a remedy as efficacious for gout and most chronic diseases as long-continued exercise on horse-back, and make a secret of it, he would gain great riches."

i. Diabetes.—Diabetes is a constitutional affection, characterized by the secretion of a large quantity of urine containing sugar; urgent, constant thirst, difficult to allay; a voracious appetite, and a progressive loss of flesh. Though many theories have been advanced as to its cause and nature, they only teach us that there exists some anomaly of organic metamorphosis, due especially to a disturbance of the function of assimilation or innervation. The disease is to-day no longer beyond the resources of the healing art.

When diabetes is the result of over-exertion of some function of the economy, especially if of the nervous system, and the glycosuria is in that undetermined state which certainly is not health, and can scarcely be called disease, then exercise is imperatively indicated.

The following extracts from Chassaigne support the above view: "M. Bouchardat, in his magnificent

studies on the treatment of glycosuria, points out the beneficial results of horse-back riding, and had he but insisted more strongly upon the use of that remedy in the treatment of this disease, we would have had nothing to add to the patient researches of the learned professor."

Bouchardat, led to do this by the practice in use in the training of pugilists, in sending his patients to labor in the fields, or to undergo a course of training in the gymnasium, had in view principally the attaining of two results: 1st. The absorption of a greater quantity of oxygen; 2d. The burning of a greater quantity of sugar.

"Under the influence of more rapid movements, a greater quantity of air is introduced into the lungs, a greater quantity of oxygen employed, and a greater quantity of heat and force produced; that heat and force necessitate a greater consumption of the alimentary materials, and that which undergoes easiest this change is sugar. It results, that being destroyed in greater proportion, it can no longer appear in the urine, and that we can thus by forced exercise utilize a greater quantity of the glycosuric aliments." (Bouchardat, "Du Diabete Sucré ou Glycosuria, son traitement hygiènique," Paris, 1852.)

Probably there is no form of exercise which fulfils more completely the indications so clearly formulated by Bouchardat than horse-back riding. Though not as severe, and the results less than those obtained

from the same number of hours per day spent in a gymnasium, the daily amount of exercise may be so proportioned that the effect shall be equal, and that, too, without causing so much fatigue.

The oxidations of sugar-forming material, if less intense than in gymnasium training, are longer continued, and keep pace with the formation of the sugar. It has the advantage of giving better air, and some degree of mental occupation.

The pleasure to be derived from a ride on horseback will often overcome the disposition to laziness and inaction which is very often a cause of injury to the sufferer from diabetes, while the knowledge that he had to undergo an hour's hard work would be very likely to keep him away from the gymnasium.

j. Obesity.—Obesity is either the result of an hereditary taint or of an acquired diathesis, and is due to a deficient oxidation or combustion of those substances which are transformed into fat in the organism.

Alimentation, though it plays a great part in the production of this trouble, is not its only cause, since slowness of circulation, especially that in the capillaries, produces this condition. With the development of this disposition, the chemical exchanges which should take place between the blood and the tissues are incomplete, the assimilative function is disturbed, the action of the nerves which preside over nutrition is altered, and the functions of the skin,

upon the proper performance of which so much depends in this affection, are seriously impaired.

In order to favor the oxidation, and thus remove from the system the materials which by successive changes are converted into fat, it is requisite that the rate both of the respiration and of the circulation be increased, that the function of innervation be regulated, that the absorption of easily assimilated substances be favored, that certain secretions be increased in quantity, and that greater exchanges of material take place in the body.

How can such indications be better fulfilled than by proper exercise, added to a mode of living based upon true hygienic principles?

We must not, however, confound obesity with a *préjugé* fatal. Young ladies whose *embonpoint*, in their opinion, is too marked, are dissatisfied with that abundance of tissue, and wrongly regarding leanness as beauty, strive by every means in their power to destroy their health in order that the proper degree of lathiness may be reached.

When in a young girl this tendency to the development of an excessive amount of fat discloses itself, the proper remedy is horse-back exercise and moderation in diet. This is the true specific against excessive *embonpoint*—not acidulated drink or substances which, destroying the health, remove not only the fat, but at the same time all pretensions even of beauty.

"A woman may be beautiful without *embonpoint*, but a really thin woman who, even at a distance, may serve as a subject upon whom the student may pursue his studies in osteology, cannot (even with the grossest flattery), be called beautiful." (Bureaud.)

k. Intermittent Fever.—Intermittent fever sometimes disappears without treatment, but this is very rare, and is almost always the result of removal from the infected locality. Flight does not, however, always effect a cure, since a single attack may have produced so profound an impression upon the system, that if the sufferer be not subjected to appropriate and sufficiently long-continued treatment, he will, if the disease does not return *per se*, suffer for years afterwards from its effects.

A number of experiments have established the fact that diaphoretics and violent muscular exercise, taken just before the chill, will retard it, and in some cases even cure the disease. ("Dict. des Sci. Med. —art. Diaph.")

The English Hippocrates, Sydenham, regarded horse-back riding as a most useful remedy in obstructions of the liver and spleen.

Ramazzini tells of a young riding-master whom he cured completely of an obstruction of the spleen following an acute attack of fever by making him, notwithstanding his debility and wretched appearance, return to his occupation.

In the febrile condition of body following improp-

erly treated intermittent fever, there is no better exercise than horse-back riding, and we regard it as the only sure means of restoring to the organs their lost energy, of re-establishing the assimilative power, and increasing the rate of oxidation in the system, and consequently its temperature.

From whatever point of view we consider the disease we are now discussing, we are forced to conclude that a modification in the nature and course of the blood is the agent producing intermittent fever, and that congestion of and enlargement of the spleen are results of that modification.

Diseases of the Nervous System.

a. Hypochondriasis.—Hypochondriasis is a mental disorder characterized by an exaggerated egoism. There is frequently some functional disorder of the brain or other organs, very often disease of certain organs, especially those of nutrition—these derangements being primary or secondary to the mental disturbance.

It happens sometimes that the physician, unable to discover the cause of the condition of his patient, or fearful of being duped, denies the existence of hypochondria as a disease. Here, however, a grave error is committed, since the disease not only exists, but with it is a faulty nutrition of the brain, producing a morbid sensitiveness as to the opinions and actions

of others, and an over-activity of the powers of imagination and observation.

As hysteria is almost peculiar to women, so hypochondriasis is confined almost exclusively to men.

We are prone to confound the seat of disease and the cause; the cause of hypochondria may be in the region which has given it its name, or it may be in any other part of the body; the seat of the disease is always the brain.

We know that epilepsy is sometimes caused by intestinal worms, and that its seat is a determined region of the cerebro-spinal axis. Is it not as great an error to confound the cause and seat of the disease in the one case as in the other?

Hypochondria is, then, a cerebral neurosis, determined by an alteration in the tissue of the brain, and characterized by an excessive over-excitability of certain nervous elements. The mental disorders resulting from it are only reflex results of disturbances taking place in other parts of the body, and are usually objective; though sometimes they are purely subjective, and are consequently entirely beyond recognition.

The sick man alone, owing to his mental condition, is capable of recognizing and appreciating them; and it is this morbidly sensitive acuteness which constitutes the disease.

It must be understood, however, that a mental predisposition to this state is necessary in order to

cause or develop this hypochondriacal condition, and that it is only after long solicitation that the faculties involved can be made to perform their functions in the irregular way which characterizes the disease. It is to this that the greater proportion of hypochondriacs in cities than in the country is due. In cities the impressions made upon the mind in a given time are much more numerous than in the country; the struggle for place, and even for existence, much fiercer.

In the city very often the excessive mental labor seriously impairs the bodily health; in the country the quiet daily routine is rarely departed from.

There is scarcely a physician in our large cities who has not had sufferers of a nervous temperament and an impressionable and irresolute character come to him seeking relief from this malady. Anxious beyond measure, melancholy in the extreme, perpetually uneasy about their health, they everywhere seek new remedies, and alas! but only making the fortune of some quack. They describe with the most scrupulous exactness a host of diseases from which they believe themselves to suffer.

To whoever will listen they will give the most minute details of their existence; each day they discover some new state or phenomena of their disease. Their minds continually dwelling upon the thought that a sudden and perhaps a very near death may come at any moment, they go to the physician and

beg him to employ any means to save them ; invariably believing that he does not do for them all that he can, or that may possibly be done, they finally become imbued with the idea that their malady is incurable. Finally, they endeavor, by the perusal of medical works, to determine for themselves the nature of their ailments ; not understanding what they read, or interpreting it badly, they finally reach the conclusion that their body is a sort of a pathological museum. Indeed, they believe that they have not one but ten diseases, and sometimes more.

Some forms of hypochondria, where at the same time there co-exist disorders of the organic life, and mental disorders which border on aberration, are, we well know, very rebellious to treatment.

Here it is of the utmost importance that the sufferer be led to forget in some pursuit of pleasure his trouble, to restore the muscular strength and to aid the digestive powers. Can we not do these far better by exercise on horse-back than by drugs ?

When not contra-indicated by disease of the urinary organs, horse-back riding is the remedy for this form of hypochondria. It shows to the patient his strength ; it does not remind him several times a day, as ordinary medicines would, that he is a sufferer, but, on the contrary, makes him forget, while on horse-back at least, his sufferings.

Besides, it exerts a very beneficial influence upon the digestive apparatus, and thus overcomes the dys-

pepsia, whether this manifests itself chiefly by a tendency to flatulence, or dependent upon catarrh of the intestines, which is so often an accompaniment of this disease.

In using this treatment, we would advise that an easy-gaited animal be chosen ; that early morning be the time selected ; that the pace be a gentle gallop or canter, and that the exercise be not so prolonged as to induce fatigue. But advising to-day horse-back riding as a cure for hypochondria is only repeating the recommendation of Sydenham, made nearly a century ago. He relates a case of a young priest, who, suffering greatly from this trouble, was completely cured by this form of exercise alone.

b. Muscular Debility.—Before studying the effect of exercise upon the muscular system, a few words as to the functions performed by muscular tissues are necessary. Within all muscular tissue, more especially if they are exercised, active combustion takes place, the heat evolved producing one of two effects : 1st. If utilized immediately, it is converted into motion ; it may be used to aid in the metamorphosis by which portions of the body are renewed or destroyed, or to increase the organic exchanges.

Muscular debility is generally the result of derangement of the organic functions, and, finally, acting reciprocally, seriously affects nutrition. Horse-back riding cannot here fail to render signal service, since

it aids digestion, and at the same time furnishes exercise for the muscles.

Muscular paralysis may be due to two causes: 1st. To a faulty innervation, and, 2d. To defective nutrition, which may render the muscles incapable of responding to the stimulus of the motor nerves.

Friedberg, in a paper upon muscular paralysis, states that, "When, as far as can be discovered, nervous conductibility, power of will, and state of the nervous centre are normal, paralysis may occur, and that it is due to a defective nutrition."

Muscular atrophy is dependent upon lesions of the cerebro-spinal axis of the sympathetic system, or upon alteration of the nutritive power especially localized in the muscles affected.

In the last forms of the two diseases above mentioned, in hemiplegia or paraplegia, where paralysis is not complete, or where the power of moving has in part been regained, in paralysis following hysteria, and in localized forms of this affection, it is evident that horse-back riding must be of great service.

It quickens the circulation, excites the nerves, and as the movements required are generally those executed by many muscles working together, the disabled part is solicited if not forced to become active.

c. Hysteria.—An affection characterized by nervous derangement, producing spasmodic contraction of the muscles, especially those of the throat, dyspnœa, palpitation of the heart, a sensation as if a ball

were ascending from the stomach to the throat, a dry convulsive cough, a disturbance of the digestive organs, and often a strange perversion of the appetite.

The patient is sometimes sad, sometimes irascible, and generally suffers from neuralgia.

The hysteric attack is but the manifestation of, not the disease itself.

"The most admissible theory of hysteria is the one which gives as the basis of the disease a trouble of nutrition of the nervous system in its totality, as in the central apparatus as in the peripheral." (Niemeyer.)

This disease is confined almost exclusively to women, and, according to the researches of Briquet, one half of them suffer from it.

Jaccoud gives as the reason why it affects women alone, "that it is a disease of the moral and physical nature, and is caused by the influence which the affections or passions, more intense and less restrained than in man, are allowed to exert upon the reasoning faculties; and also that the nervous organization of woman is such that a predisposition to this trouble is created."

More influenced than man by all impressions affecting herself, woman is less apt to control them; she is powerless to prevent the automatic and involuntary reactions which excitements produce upon her; and often tired of the struggle, even before she has attempted it, she allows both will and reason to be

subdued by sensible and psychical impressions, of which these two faculties alone should be the sovereign regulators.

It is now a recognized fact that the agent of the materia medica proper seldom, if ever, does more than palliate this trouble, and that the proper treatment consists in appropriate regimen, suitable mental occupation and exercise.

In man there often exists an analogous state, indicated by melancholy, fear, palpitation of the heart, ringing in the ears, headache and disordered digestion.

With these states we may group certain disorders, having their seat in the reproductive organs, such as nymphomania, onanism, impotency, and sterility—all caused by the same moral and mental conditions and yielding to the same treatment.

d. Chorea (St. Vitus' dance).—A disease characterized by irregular, tremulous, and often ludicrous movements of certain portions of the body, usually of the head and face, the movements being to a slight extent under the control of the will.

After the disorder has persisted for a time, the brain seems to become involved, and impairment of the memory and irritability of temper result; the digestive organs become involved also; sleeplessness follows, and finally the general health suffers.

It is a disease of childhood and puberty, rarely occurring before the age of six, most frequently between

six and seventeen, and but seldom at a more advanced period. It is very probable that any influence capable of producing a strong and sudden shock to the nervous system may become an exciting cause of chorea ; thus fright is one of its commonest causes. Irregular dentition, strong mental emotion, blows or falls, the irritation of intestinal worms, etc., etc., all may induce an attack.

A delicate constitution is a strong predisposing cause.

In studying the effect of horse-back riding upon anæmia and chlorosis, we saw how the digestive organs were aided, the circulation quickened, the nervous system strengthened, and the general tone of the body improved.

In chorea, the co-ordination of muscular power which horse-back exercise requires, together with the moral influence exerted by it upon the sufferer, are added to the beneficent effects before mentioned, and cannot but be of great benefit. We now speak, of course, of the disease in its beginning, when there exists still a certain amount of control over the movements of the body. Later on, the violence and irregular nature of the muscular contractions may be almost a bar to sitting on horse-back, yet here even much may be done.

Diseases of the Organs of Respiration.

a. Phthisis.—Accidental or hereditary causes may or may not develop the tuberculous diathesis; when developed, it may be grave or slight, curable or incurable. At least such is the only deduction that can be drawn from the contradictory facts daily recorded by chemical observers of the unexpected development or absence of the rapid growth of or unlooked-for recovery from that disease. From a diagnostic point of view, nothing gives us a better account of the differences of which tuberculous modifications are susceptible than the more or less intense and persistent effect experienced by the nutritive functions.

We may go further and state that the alterations in the digestive and assimilative functions is the proper characteristic of the morbid modifications of the organism, upon which the development of tubercle depends.

This is not a new theory, for, long before our time, physicians and physiologists had recognized the fact that any agent which tended to diminish the physical energies of the system might give rise to tubercle; but it is only to-day that these views have received a scientific demonstration.

A few years since, Royer-Collard called the attention of the physicians to an art which had been sadly neglected, and, according to his statements, one from

which excellent results could be obtained. To this he gave the name of Organoplastique-hygiene.

It consists in so controlling the nutritive function, by means of suitably arranged alimentation and exercise, as to correct a faulty or vicious organic condition, and thus replace a crumbling ruin by a substantial edifice.

As an example of the results procured by this system, we may instance the training of horses for racing, or of men for the ring or rowing. While I cannot admit that hygiene possesses a generic power sufficient to change the constitution of a man, I still believe that it is capable of converting a diseased condition into a healthy one, and of effecting this in a person in whom disease has already manifested itself, provided, of course, that no important organ be too deeply involved. The indications for treatment in this state or tendency are plain : to introduce into the body materials from which fibrine to make the tissues and blood discs to carry oxygen can be readily made. In order to do this, two conditions must be fulfilled : 1st. To select food suitable in quality and properly prepared, and, 2d. To cause the organs whose duty it is to elaborate and assimilate the ingesta to perform their functions in a more perfect manner than they are doing under the influence of the morbid condition.

Physical exercise, without doubt, is one of the best means of intensifying the organic acts. Under the

influence of exercise, proportioned, both as regards severity and duration, to the strength and condition of the individual, the circulation is increased in force and frequency, the amount of effete material voided by the skin increased, the secretion of mucous membranes lessened, and the digestive and assimilative powers improved. One of the most efficacious means, then, that can be employed by the physician, in correcting vicious tendencies in an organ or rebuilding a shattered frame, is a properly arranged system of diet and exercise ; these two means are the foundation upon which has been built up the science to which Royer-Collard has given the name of Organoplastique. We regard these means all the more favorably since they not only work directly, but by causing a portion of the psychical force which would otherwise be expended in destroying the body, to be used in opposing the disease, thus reducing the nervous excitability, which is in certain cases the worst form with which the physician has to deal.

Among the remedies that have been regarded by both ancients and moderns as of especial benefit in phthisis, exercise on horse-back stands in the first rank.

Sydenham considered it the specific in such cases, and probably the best way to show with what favor he regarded horse-back riding is to quote his statement :

" Some relatives of mine," says he, " who have

been attacked with that malady have been cured by continuing for a long time that exercise upon my advice. I certainly know that any other remedy, however precious it might be, and any other method would have been perfectly useless to them. It is not only in slight cases of consumption, accompanied with frequent coughing and loss of flesh, that horse exercise has proved useful, but also in confirmed consumptions, accompanied by night sweats, and even by that fatal diarrhœa which ordinarily is a sign of the last stage of the disease, and the harbinger of death." ("Dissert. Epis. de Passione Hist., p. 476.")

b. Bronchitis.—Beau divides all cases of bronchitis into two classes : 1st. That form in which subcrepitant rales are heard—there is more or less fever, and seldom severe dyspnœa ; whether the attacks be acute or chronic, they are not repeated, and complete recovery or death is the sequel. 2d. Where the rales are mucous, fever is generally absent, the dyspnœa may be very severe, and tuberculosis, as a complication, very seldom exists. Loud rales may often be heard in the trachea. It is seldom that it proves mortal.

Horse-back riding, by increasing the amount of air respired, and by the jarring motion communicated to the respiratory organs, aids in the expulsion of the mucus which obstructs the air tubes, and renders it possible for air to reach the pulmonary vesicles.

c. Asthma.—There are two theories as to the cause of this trouble : 1st. That it is due to bronchial

secretion. This view is the older one—the one advocated by Galen and Celsius; the other, that it is caused by bronchial spasm, is the theory of Van Helmont and Willis. With Beau, I believe that nervous asthma is only an intermittent bronchial catarrh, and that the dyspnœa, the feature of this disease, is caused by the resistance which the mucus, in the small bronchial tubes, offers to the passage of air. It varies in intensity with the degree in which the bronchi are obstructed.

Sonorous and sibilant rales are produced by the air passing through these parts of the bronchial tubes, which have a smaller calibre, on account of the mucous deposit. They are louder and more numerous during expiration, as then we have not only the obstruction in the air tubes, but a diminution in the size of the tubes themselves, due to the contraction of the lung. Sometimes the obstruction is complete, and then, no air passing, there is absence of all sound in that portion of the lung—this is known as absence of vesicular murmur. Rales and absence of vesicular murmur may alternate with each other, since coughing may render a complete obstruction incomplete, or *vice versâ*. Air is sometimes entrapped between the terminal extremity of the bronchi and the mucous obstruction.

The movement of expiration or of coughing tends to compress it, but this tendency is resisted by its elasticity, and the air cells are dilated, constituting

emphysema. The physical signs of this condition are increased size of chest, a prominence of the tissue between the ribs, and an increase in the intensity of the respiratory sounds. This lesion bears the same relation to asthma that dilatation of the left ventricle does to insufficiency of the aortic orifice or of the stomach in cancer of the pylorus.

We have seen that horse-back riding modifies the functions of the organic life, as well as those of the life of relation—just the ones that are affected in asthma. By horse-back riding the cutaneous circulation is intensified, excretion by means of the skin increased, and, owing to the increase in the amount of blood in the skin, the general circulation is modified, and therefore nutrition and muscular contractility; the lymphatic circulation is quickened, and thus in pathological cases serious infiltrations are sometimes removed.

Organs of Digestion.

a. Dyspepsia—Gastralgia—Pyrosis.—Many writers regard the functional troubles of the digestive organs only as symptoms of some acute or chronic disease, and not as distinct neurosis, no matter what relation the nervous system may have to the disorder.

These writers would scarcely assign a place to those alterations of sensibility and contractility of the stomach and intestines which are known as gastro-enteralgia.

Chomel, and with him a large school, regard pain, and with good reason, as only of secondary importance in alterations of the digestive functions.

"There is," says Beau, "dyspepsia whenever there is trouble, weakness, or absence of the digestive act, whatever be its symptoms, and whatever be its causes." He also regards any diminution, absence, or alteration of the absorbable alimentary products as a dyspeptic affection.

We say, then, that there is dyspepsia when the gastric juice is abnormal, either as regards quantity, quality, or both; when from any cause the movements of the stomach or intestines are lessened or entirely wanting, or when the actions of the nerves which control this act are altered—and then we have a true neurosis.

It is seldom easy, it is more often impossible, to determine with precision the seat and cause of dyspepsia. If we but think how complex are the physiological conditions upon which perfect digestion depends, how many and how varied are both the articles submitted to the action of the digestive work, and of the elaboration and transformations which they are to undergo, before they reach either the liver or lungs, we will no longer wonder why the point of departure from the proper way escapes our notice.

Though Cl. Bernard's discoveries have greatly enlightened us, yet it is but too true that a dyspepsia

regarded as having its origin in the stomach may depend upon functional lesions of the intestines, or of the spleno-hepatic apparatus. Clinical observation leads us to regard dyspepsia as essential, symptomatic, or sympathetic—the latter being the result of pathological reflex actions.

According to Durand-Fardel, the symptoms of dyspepsia are : a digestion always slow, painful, or difficult, cardialgia, with increased sensibility to pressure, a development of gas in the stomach or intestines, constipation and anorexia. These are the principal symptoms of dyspepsia, and their presence constitutes its chief characteristic. Though they may not present themselves as we have given them, yet they none the less constitute the most marked features of dyspepsia, and, predominating in most of the sufferers, they give place to other symptoms, which in their turn are masked or replaced by a third series.

Dyspepsia, we must remember, is not alone a symptom of gastric disorder ; for on the one hand we have true neurosis, and on the other alterations in the blood, mingling their symptoms with the more local ones characteristic of the digestive disorder. To acknowledge that digestive disorders, be their cause what it may, produce perversion of the nutritive function, is to admit as a consequence deficient hematose, due to impoverished blood, loss of strength and of flesh, and the development of a

cachectic state. Dyspepsia does not always manifest itself in the same way ; sometimes a severe pain over the region of the stomach, accompanied by or alternating with others of a like neuralgic character, to which the name gastralgia is given ; sometimes as a burning sensation in the stomach, pyrosis ; generally there is slowness and difficulty of digestion, a tendency to flatulence, nausea, and anorexia. These are but symptoms of a disordered innervation.

There is a deficiency in both quantity and quality of the fluids secreted by the gastric mucous membrane, and the muscles not being sufficiently stimulated remain inert.

The first indication to be fulfilled is to restore the nervous power, or rather to recall the contractility of the muscular coat of the stomach. Horse-back riding acts strongly upon the digestive apparatus, both by the movements of the viscera which it occasions and the function it produces. It serves as a mechanical excitant to determine energetic contractions of the muscles of the stomach. From this exercise, the muscular coat gains strength ; digestion is easier ; absorption more complete ; nutrition more perfect, and the nerve regains its power and resumes its functions. Of course this applies especially to that form of dyspepsia where there is a languid state of the digestive functions, with muscular atony.

It will not be nearly as efficacious in that form of dyspepsia where pain is the chief symptom—in true

neuralgia of the stomach. Here its action will be far slower, though in the end a cure may follow.

Antyllus had, it seems, a practical knowledge of the beneficial effects of riding when he said, "Equitatio maxime stomachum firmat."

b. Constipation.—Of all the symptoms of derangement of the digestive organs, the most troublesome, and at the same time the most rebellious to treatment, is constipation. Probably the only remedy from which we can expect a radical cure is continued daily exercise, either on foot or on horse-back, in the open air.

VI.

HYGIENIC EFFECTS OF HORSE-BACK RIDING.

In an authentic description of the life of Diane de Poitiers, one of the most remarkable of the royal favorites, we are told that the "extraordinary and almost fabulous duration of her beauty was in a great degree due to the precautions which she adopted."

When she entered her fiftieth year, her charms were those of a woman of twenty-five. To account for a fact so extraordinary, her enemies invented a story to the effect that she dealt in the black art, and that she was indebted for her perennial beauty to potions compounded by unholy hands.

But Diane's magic was one which any lady may practice without endangering her soul: the magic of amiability, regular habits, and, above all, vigorous exercise.

"She suffered no cosmetic to approach her, denouncing every compound of the kind. . . . . She arose every morning at six o'clock, plunged into a cold bath, and had no sooner left her chamber than she sprang into the saddle, and having galloped a league or two, returned to bed, where she remained until mid-day engaged in reading."

This system appears a singular one, but in her case undoubtedly proved most successful.

"Six months before her death," says Brantôme, "I saw her so handsome that no heart of adamant could have been insensible to her charms. . . . . She had just been riding on horse-back, and kept her seat as dexterously and well as she had ever done in her youth." BRANTÔME, *Sketch of Diane de Poitiers.*

So far we have examined only the physiological and therapeutical effects of horse-back riding; now we are to consider its hygienic uses—that is, we are to study it not as regards its power to cure or relieve

already existing ailments, but as to its powers of prevention.

While the value of medicine as an art has often been disputed, and the question raised whether, proper allowance being made for the good or evil, humanity would not fare just as well if left entirely to nature's resources, the usefulness of hygiene has never been questioned. Its rules and principles are based on experience, its sole aim is the preservation of health, its basis is admitted and its principles are respected. It is hygiene which teaches us how to live fully our life; for it has well been said that man does not die—he kills himself.

A misanthrope, analyzing human life, finds it to be composed of three years of happiness, diluted with sixty or eighty of pain, trouble, and *ennui*. Yet in spite of the bitterness of the draught, how we dread that supreme moment when the cup is to be taken from our lips!

It is generally thought that in the early ages of the world, the earth, younger and more prolific in the principles of life, produced stronger men than those of the present day. Imagination, which delights in the wonderful, implicitly believes all that tradition hands down relating to the patriarchs of the Bible, whose lives extended through several centuries. Modern science, after proving that the chronology of those remote ages was very different from ours, has rectified this mistake.

Henser and other authors have proved that the year consisted of three months only, before the time of Abraham ; after this patriarch it was composed of eight months, and that it was not until after the time of Joseph, the minister of Pharaoh, that it had increased to twelve months.

King David says, " The days of our years are threescore years and ten ; and if by reason of strength they be fourscore years, yet is their strength labor and sorrow ; for it is soon cut off, and we fly away." (Psalm xc., verse 10.)

Modern statistics show that the average length of life for some centuries past is gradually increasing ; thus, for example, that the average life, which was 24 years and 4 months in the seventeenth century, and which increased to 30 years and 8 months in the eighteenth century, is now 38 years and 9 months.

In the seventeenth century, half the new-born generation died before the age of 12 years, three fourths did not live to the age of 47, and four fifths died at the age of 55 years. In the eighteenth century, the increase is remarkable. At last in the nineteenth century, the half of the newly-born generation lived to the age of 38 years, a fourth part reached the age of 68 years, and a fifth extended beyond the age of 71 years. The probable life from the time of birth has increased more than threefold since the seventeenth century.

It has been the object of research from the remot-

est ages to decide the duration and natural limits of human life. Among modern theories, we have first that of Schubert, which has for its basis the revolution of the earth. He maintains that the human life ought to be $70\frac{9}{10}$ years, because it should have as many days as the precession of the equinoxes (founded on a particular movement of the axis of the earth) includes years—that is to say, 25,920.

Buffon, supported by a physiological idea, has established as a principle that the entire duration of life can be measured in some manner by that of the time of its growth. But this great naturalist missed an essential point in the solution of this problem: he did not know the precise sign which decides the time of growth.

Flourens has found this sign in the reunion of the bones to their epiphysis. It is at the time when the bones are consolidated to their epiphysis that animals cease to grow. This reunion takes place generally in man at the age of 20; in the horse at 5 years; in the lion at 4, and in the dog at 2 years. Now the horse lives to the age of 25 years, the lion to 20, and the dog to 10 and 12, which makes it nearly five times the length of the growth. Thus the life of man, regular and free from accidents, ought to last a century at least.

Flourens, in extending thus the length of life, must be adopting an unusual classification of its different periods. According to him—and his doctrine is the

result of long observation—the ages are divided into four series: First infancy, from birth to the age of 10 years; second infancy, or adolescence, from 10 to 20 years. First youth, from 20 to 30 years; second youth, from 30 to 40. First manhood, from 40 to 55 years; second manhood, from 55 to 70. First old age, from 70 to 85; second old age, from 85 to death.

Flourens prolongs the period of adolescence to 20 years, because at that time the development of the bones is completed, and, as a natural consequence, the growth of the body in length. If he extends youth to 40 years, it is because at that age the body attains its final size, whatever it gains afterwards being only an accumulation of fat. Then if he prolongs manhood to 70 years, it is because he perceives a work of invigoration, which renders every part of the body stronger and more complete—which work begins at 40 to 55 years, and continues nearly to the age of 70.

Old age then commences. According to this author, its characteristic is the loss of strength in reserve; there remains for the old man the active power only, that of the moment.

Two celebrated physiologists, Haller and Hufeland, had already, prior to the researches of Flourens, opened a vast perspective to this desire for longevity, which is one of the weaknesses of mankind. Haller sought to estimate the natural length of human life,

and, supporting his theory on historical evidence, he placed it between 90 and 100 years.

Hufeland, more recently, following a different order of ideas, arrived at conclusions almost identical with those of Flourens.

Leaving this digression, for which we ask pardon of the reader, let us briefly show the influence horse-back riding may have on the prolongation of our existence.

Whatever the average duration of life may be, the fact remains that most men die from disease; few if any from old age. Now as then the statements, "Non accepimus brevem vitam sed facimus" (Seneca) and "Inaction weakens the body, exercise fortifies it; the first brings on premature old age, the second prolongs adolescence," are true.

An examination of the physical structure of the body, its admirable mechanism, the flexibility of its articulations, and of the quickness and strength which exercise gives, leads us to conclude that it was not made for inaction. Frederick the Great's saying that "When I look closely at our physical structure, I am almost tempted to believe that nature intended us for postilions rather than for men of erudition," may not be so very wrong after all.

We trust, then, that we will no longer be accused of riding a hobby when we advocate with what strength we can the claims of an agent which at the very least exercises a conservative influence upon the

organism, if it does not restore to a sickly one its normal vigor, and which must be therefore regarded as a hygienic remedy of the greatest importance.

All good things, as we know, when abused may become active agents of evil, and the best remedy when given at the wrong time, or without proper regard to the dose, age, temperament, or idiosyncrasy, may be the cause of grave trouble, and this is the case with horse-back riding. Wisely directed, it is an excellent means of cure; wrongly employed or abused, it may prove a cause of disease. By abuse I do not mean only a too prolonged but too violent exercise, as when there is too great a disproportion between the action of the horse and the strength of the rider.

Horse-back riding is injurious in all acute diseases, even where the weakness of some organs would seem to call for its strengthening influence. Want of strength in the rider, the effect of the agitation he must undergo, and the increased local irritation and general excitation that it would produce, all forbid its use.

In the chronic phlegmasia so often occurring in the pulmonary system, it should be absolutely prohibited, as the already existing oppression would be increased by it, unless the sufferer be willing to walk his horse. In that case, since an opportunity of breathing fresh air without fatigue or excitement would be afforded, the result could be but beneficial.

Sometimes hæmoptysis has been produced by riding rapidly against a strong wind. There must have existed a morbid predisposition of the system.

Many authors, as Ramazzini, Cabanis, Loude, etc., state that an excessive indulgence in horse-back exercise produces aneurism of the aorta, and it is generally acknowledged that horse-back riding is a very frequent cause of hernia. The continued pressure upon the intestines made by the diaphragm and intestinal walls, draws back the parts which form the ring, and this continuous pulling will in time so far relax it as to render a hernia a very possible effect.

Urethritis is said to have been caused by riding; as it would be benign, rest for a short time would prove the remedy.

Horse-back riding is of course contraindicated in diseases of the urinary organs and in sufferers from hemorrhoids. The results of inquiries lead me to conclude that hemorrhoids only are developed from horse-back riding in those who make this exercise a profession.

If we examine carefully as to the health of those leading a sedentary life, we will find that a greater portion of the affections to which they are subject results generally from lack of proper exercise in youth, thus preventing complete physical development, both as regards the form of the body and the functions of its organs. The impoverishment of the blood may be so complete as to destroy life, or only partial, and

thus entailing a long chain of diseases; or the lack of exercise may be during adult life. In this case the inherent force or vitality of the individual may for a long time overcome all injurious influences, but sooner or later we see morbid phenomena show themselves, without being able to trace out their cause, or state the exact time at which they began.

One of the natural results of exercise, and one whose influence is of not less importance than the physical improvement, is that the regular and persistent application of the will to the overcoming of the want of energy and bodily laziness gives the moral and mental control of the physical nature, and leads, therefore, to an increase of the force of will and action in general, to greater firmness of character and strength to bear the adversities of life, and develops a persevering power of resistance against that tendency to yield to disease which so often in chronic cases is a worse enemy than the disease itself.

Exercise maintains not alone the bodily health, but also strengthens and invigorates the mind. "All the forces of the soul are increased and revivified by exercise," says Galen, and "native heat is maintained within the limits of health by moderate exercise of the body and mind."

In every situation of life, in health or disease, the physical is always more or less influenced by the mental condition, and *vice versâ*. Who has not enjoyed that feeling of thorough well-being on occa-

sions of great joy? Who is it whose digestion is not better when all his thoughts are pleasant and joyful?

And if I am asked why I select horse-back riding in preference to any other form of exercise, or why it influences the mental and moral nature to a greater extent than any other, I answer readily because it pleases more. Man (and I include here the best half of mankind) grows all the fonder of horse-back riding from practice; he is happy while riding, for there is neither room nor time for sad thoughts. For the majority of women it is more than a mere pleasure-party; it is an occasion for a special toilet which is becoming to almost all.

Origin and Progress of Horse-Races.

ORIGIN AND PROGRESS OF HORSE-RACES.

THE Curetes, or Dactyli, the five brothers to whom Rhea had intrusted the education of Jupiter, having completed their allotted task, departed from Mt. Ida, and went to Elis.

"One day, the eldest brother, Hercules, in order to relieve the tedium of their new condition, proposed that they should run a race, and offered as a prize to the successful contestant a crown of olive." (Mémoires de l'Abbé Gédoyn.)

According to the legend this sportive contest was the origin of those games which in succeeding ages gained such celebrity, and for which the Greeks, especially, ever manifested the most enthusiastic fondness.

Undoubtedly the first races were simply foot-races. The horse roamed his native wilds a magnificent but savage creature, for the art of training his fierceness and rendering him subservient to the use of mankind had not yet been discovered. Necessity, the mother of invention, was still to make known to the people of those early times the advan-

tages of domesticating an animal so absolutely essential to our modern civilization.

Each father of a family lived on the spot where he was born, occupying himself solely in cultivating his ancestral heritage; the earth was tilled by the aid of "the patient ox," and the ass was the sole beast of burden employed; for, capable of enduring the greatest hardships and requiring but the scantiest fare, this animal, despicable in our eyes, was then held in high esteem. No one, whatever his condition, whether chieftain or servitor, ever dreamed of wishing for a better or more honorable animal for riding. Luxury and refinement had not then created in man an infinitude of imaginary desires; natural wants were the only ones he troubled himself to satisfy.

This condition of primitive simplicity, however, was destined to form no exception to the inexorable law of change stamped on all human affairs; an alteration in manners soon took place, and different manners introduced different usages.

Fifty years after the deluge of Deucalion, which in the time of Moses inundated Greece, Clymenus, one of the descendants of the Idean Hercules, emigrated from Crete into Elis, reigned there, and celebrated games at Olympia. Then Endymion, son of Æthlius, drove Clymenus from Elis, and usurped the throne; but wearying speedily of power so easily gained, he offered the kingdom to his own children,

as a prize in similar exercises. These races, like the earliest, were both foot-races. It was not until some time after this, that Bellerophon, the young hero, impregnable in courage and virtue, appeared in Greece, discovered the art of taming the steed afterwards famous in legend and story under the name of Pegasus, and employed it in his triumphant combat with the Chimæra.

Now, as Bellerophon, son of Glaucus and grandson of Sisyphus, was the sixth in direct descent from Deucalion, and lived during the time that Ehud judged Israel, we must infer that the equestrian art began to be practised in Greece about 2650 A.M., thirteen or fourteen centuries before the Christian era. In Egypt, on the contrary, the horse had long been a domestic animal. Pharaoh, who, while pursuing the Israelites, was engulfed in the Red Sea, had with him, according to the Sacred Word, besides "horsemen, six hundred chosen chariots, and all the chariots of Egypt, and captains over every one of them." The Israelites, therefore, could not have been ignorant of the uses of the horse, although they themselves probably employed it only to a limited extent. "Thou shalt not covet thy neighbor's house, thou shalt not covet thy neighbor's wife, nor his man-servant, nor his maid-servant, nor his ox, nor his ass," says Moses in the Decalogue; he does not mention the horse, for the simple reason, undoubtedly, that it was not yet in common use. In

the first chapter of the Book of Job, we read also that this faithful servant of God was the owner of "seven thousand sheep, three thousand camels, five hundred yoke of oxen, and five hundred she-asses;" but hearing nothing of horses, we infer accordingly that throughout the East they were employed very little, if at all. But to return to Bellerophon. His encounter with the Chimæra took place in Lycia, whither he had been sent by Prœtus, with the design of causing his death; and the fame of his adventures being quickly diffused in all the adjacent regions, immediately there sprang up among the princes and heroes of Greece an eager rivalry in regard to horses, each endeavoring to become the possessor and raiser of as large a number as possible. Many a city grew into wealth and renown through this new object of interest, but from their manifest superiority, the breeding horses of Epirus, Argos, and Mycenæ soon bore away the palm from all competitors. The Thessalians, a tribe settled both in Greece and Macedonia, acquired at this period an enviable reputation as equestrians; mounted on perfectly tamed steeds, they fearlessly encountered wild bulls, from which circumstance they derived their name of Centaurs.

The Lapithæ, another people of Thessaly, excelled not only in manufacture of beautiful saddles and every variety of caparison, but in the more difficult art of training and managing horses.

Thirty years after Endymion, Pelops celebrated

games at Olympus, in honor of Jupiter, with more pomp and splendor, according to Pausanias, than any of his predecessors. This prince had just gained a signal triumph over Œnomaus in that renowned chariot race in which the reward of victory was no more insignificant prize than the sovereignty of Pisa and the hand of Hippodamia, the most beautiful princess of the age; we can readily believe, therefore, that horse and chariot as well as foot races were a prominent feature in the games of Pelops. Still, until a period long subsequent to this, horses were a rare and valuable possession, a fact which explains the fables so numerous in the ancient mythologies. Poets wove into song and story how "the father of gods and king of men," having spirited away the beauteous Ganymede, gave to Zeus, the father of the youthful cupbearer, in order to console him for the loss of his son, horses of marvellous qualities; how Neptune sent as a gift to Copreus, King of Haliartus, in Bœotia, the famous charger Areion, endowed with a human voice and the gift of prophecy; how, at the marriage of the heaven-born Thetis with Peleus, child of earth, the gods who had honored the nuptials with their presence, wishing to testify their liberality and good-will, Neptune gave as his contribution to the marriage portion two magnificent horses; and how, at the games of Patroclus, Menelaus harnessed his horse, Podarge, with Agamemnon's mare, the superb Æthea, which derived her

origin from the divine steeds, presented to Zeus by Jupiter himself.

Such legends are incontrovertible evidence that in those days a fine horse was something extraordinary and of almost priceless value.

Chariots were introduced into Greece at nearly the same epoch as horses. Cicero, with due respect for immortal powers, attributes their invention to Minerva, Æschylus to Prometheus, Theon, the scholiast of Aratus, to a certain Trochilus; but common opinion, which Virgil follows, assigns the honor to Eruthonius. After Pelops, Amythaon, son of Cretheus, and cousin-german of Endymion, again afforded to the Greeks the pleasing and ever-welcome spectacle of Olympic games. After him, Pelias and Meleus celebrated them at their joint expense; then Augeas, and finally Hercules, son of Amphitryon, when he had completed the conquest of Elis. We cannot doubt that at all these celebrations, horse and chariot races bore a prominent part, especially at the last, where we are told that Janus, the Arcadian, gained the prize for horse-racing, and Iolaus, the voluntary companion of the labors of Hercules, carried off the chariot prize, and was crowned by the hand of Hercules himself, whose mares he had borrowed for the occasion.

According to Pausanias, it was a convenient fashion of those days to borrow horses that had acquired a reputation for extraordinary swiftness.

After the time of Pelops, who was contemporary with Bellerophon, it became customary for each king to celebrate his accession with games; and horse and chariot races never failed to form part of the spectacle.

Fifty years prior to the siege of Troy, Nestor had disputed the prize in a chariot race with the son of Actor, and about fifty years still earlier, at the obsequies of Azan, son of Arcas, Etolus, giving free rein to his flying horses, had overthrown Apis, who died from the effects of the injuries thus received. It is evident, therefore, that races of various kinds formed part of the funeral ceremonies from the very earliest period of their introduction; for Etolus was contemporary with Bellerophon, from whose epoch dates the use of horses among the Greeks.

Four hundred years after the conquest of Troy, according to Father Péton, and twenty-three years after the founding of Rome, Iphitus, a descendant of Oxylus, on the authority of the Delphic Oracle, re-established the Olympic games. It was then, indeed, that these games first assumed fixed forms and were regulated by judicious laws, and that their celebration having become exactly periodical, the Greeks began to compute time by Olympiads.

But after such a long discontinuance, says Pausanias, the different exercises which had formerly been practised sank into almost entire oblivion, and it was only gradually that each was recalled to memory and restored to its place on the list of national games.

Foot-racing, the most ancient and natural of sports, was first re-established; but soon boxing, the pentathlon, the cestus, the poncratium, and particularly horse and chariot races had again resumed their former prestige.

There were three principal classes of horse-races, the first two differing chiefly in the kind of animal employed—one being run with saddle horses, the other with colts. The first ode of Pindar sings the praises of Hiero, King of Syracuse, who was victor in a contest of saddle horses; and in the 128th Olympiad, when the second form of racing was instituted or re-established, Hepolemus of Lycia carried off the prize. A third kind, called the calpe, consisted in running with two mares. The contestant mounted one and led the other by the bridle, and just before reaching the end of the course, leaped to the ground, and finished the race by leading both animals to the goal. These three modes of racing had many points of resemblance, however, as well as difference. They were all run without stirrups, the invention of which dates long after this period; to all, children were admitted as contestants on the same conditions as men, and, finally, it was necessary in all for the riders, before finishing the course, to make the circuit of a goal, set up in a place so cramped and narrow that whoever, in any degree, lacked skill and address, ran great risk of falling from his horse and losing the victory.

"I formerly believed," says the Abbé Gidoyn, "that it was obligatory only in chariot races to pass round the goal; but the following passage from Pausanias undeceived me: 'The mare of Phidolos of Corinth,' says he, 'well deserves that I should call attention to her merits. The Corinthians name her Aura. Her master having fallen at the very beginning of the race, not for an instant did she slacken her speed, but running on with the same care and judgment as if she still felt his guiding hand, she made the circuit of the goal, redoubled her efforts at the sound of the trumpet, and at last, conscious of having gained the victory and merited the reward, stopped in front of the judges' stand. Phidolos was proclaimed victor, and obtained from the Eleans the privilege of erecting a monument on which himself and his mare were represented." From this passage we learn that towards the end of a race a flourish of trumpets animated the combatants to renewed efforts, and we must also conclude that the horse and chariot races were run in different inclosures. A horse would find no difficulty in turning where for a chariot to turn would be an utter impossibility; consequently the same goal would not have answered for both. The Stadium, a space of about six hundred English feet, was the scene of the foot-races, the Hippodrome of the horse-races; and there was also a special place assigned to the contesting chariots.

The Hippodrome must have been longer than the

Stadium, for it would have been manifest injustice to subject men and horses to the same test, and, moreover, Pausanias positively asserts that the Hippodrome was twice the length of the Stadium.

But let us proceed to consider more in detail the subject of chariot races.

The Greeks denoted a chariot by the word *harma*, which is almost the only expression employed by Pausanias. Hence we conclude that solely one species of chariot was used in these games, and that any difference consisted rather in the animals attached to the vehicles, and in the manner of attaching them, than in the vehicles themselves.

The chariots of the Greeks were more or less ornamented according to the rank and wealth of their owners. Homer relates that Diomedes appeared at the obsequies of Patroclus in a car resplendent with gold and metal ornaments. That of Menelaus was equally superb, and many others rivalled them in the magnificence of their decorations. If in this simple and primitive age, and in time of war, the Greeks already lavished such ornamentation on their chariots, what idea must we conceive of those sent to the Olympic games, the solemn and magnificent spectacles that every fifth year summoned all Greece to the sacred spot of their celebration, and at which kings and princes of world-wide fame, such as Hiero, Gelon, and Philip of Macedon contested the prize,

either in person or by proxy, in the persons of their equerries.

We can readily believe that on such occasions the creative genius and the love of beauty inherent in the Grecian mind would be displayed to the fullest extent, even in a matter apparently so unimportant as the decoration of a chariot.

Diversity of ornament, nevertheless, does not necessarily imply any noticeable diversity of construction; but great variety was gained, and games and contests were multiplied according as the cars were drawn by two horses or four, by young horses or those over five years of age, by colts or mules. A car to which two horses were yoked was termed in Latin *biga*, in Greek *synoria* or *synoris*, an expression which Plato happily uses to signify the union subsisting between one soul and body. Racing between chariots drawn by two horses of five years was made a prominent feature of the Olympic games in the 93d Olympiad.

At the period of the Trojan war the Greeks frequently attached three horses to a chariot; but this practice was never introduced into any of the national games.

Four horses, however, were often yoked to a chariot, and were called *tethrippos*, *tetroris*, and *tetroria*—in Latin, *quadriga*.

This kind of race was the most honorable and beautiful of all, and was either instituted or renewed

at no later period than the 25th Olympiad, remarkable for the victory of the Theban Pagondas. The Greeks never drove four horses in the modern fashion, two and two, but all abreast. The middle horses, called *jugales*, were usually those esteemed the poorest; the best, styled *funales* or *lorarii*, were placed outside, and special care was taken that the horse on the left should be one thoroughly trained. To a certain extent, this horse directed the movements of the others, as it was necessary to turn to the left in making the circuit of the goal.

Nestor, exhorting his son, Antilochus, to make every effort to obtain the prize offered by Achilles, addressed him thus: "Approach as near as possible to the goal; to obtain this result, leaning forward on your chariot, gain the left of your rivals, and inciting the horse beyond your hand, give him loosened reins, while the horse under your hand will pass so close to the goal that it will seem as if the nave of your wheel grazed it in doubling."

The place of meeting for both horses and chariots, which the Latins called *carceres*, was an extensive inclosure immediately in front of the race-course.

The race-course had also its separate inclosure, denoted in Greek by the word *balbis* or *usplegx*, in Latin by *claustrum* or *repagulum*. Pausanias describes the whole portion of ground allotted to the games, with all its different divisions, as follows;

"Beyond that part of the Stadium where the directors of the games sit is the space assigned to the horse-racers; in front of this is a large field, marked off in the shape of a ship's prow, and in such a manner that the back is turned towards the lists. At the spot where the field adjoins the Portico of the Agnaptus it gradually widens on both sides, and at the extremity of the beak, and raised to a great height, is a bronze dolphin, supported on a column of iron.

"The field is more than 800 feet in circumference, and along its sides stalls have been built for the accommodation of horses and chariots, and these stalls are divided by lot among the combatants. In front of each row of stalls, from one extremity of the field to the other, extends a thick rope which serves as a barrier to keep the horses and chariots in their respective places until the proper moment.

"Near the centre of the prow-like field stands an altar of unbaked brick, which before each Olympiad is carefully washed and whitened, and over it a bronze eagle stretches its widely-expanded wings.

"By means of machinery this eagle is suddenly elevated and rendered visible to all the spectators, while at the same instant the dolphin at the end of the inclosure is lowered to the earth.

"At this signal the ropes drop, and immediately the combatants advance from every side and meet around the dolphin. Here they are carefully paired and

matched, and now they ride into the lists, where the address of the charioteers and the swiftness of the horses decide the victory."

Such is the idea we gather of the Olympian rendezvous from the pages of Pausanias. He mentions only stalls or coach-houses for the horses and chariots, but there is ground for believing that these structures were arched and consisted of more than one story, in order to furnish apartments for the use of the participants of the games.

It is probable, too, that, occupying a site so frequented and celebrated, where the exhibition of any thing like extraordinary skill would confer corresponding honor upon the architect, they abounded in decoration and ornament.

Still following the authority of Pausanias, we find that the race-course for chariots consisted of two divisions—the longer of the two being an artificial terrace, the other an elevation of moderate height; but he furnishes no statistics concerning the length and breadth of the inclosure, though it could not have been less than several hundred feet.

One author has been guilty of a fault common to historians, viz., that of thinking only of the times in which they write, and forgetting that the human institutions they are describing are not perpetual, but as perishable as men themselves. "Debemur morti nos nostraque."

These games, therefore, consecrated by religion,

and forming not the amusement but the delight and dominant passion, or, to speak more truly, the serious occupation of a whole nation, and that nation the most renowned and polished the world could then boast, have experienced the same unhappy fate as the people among whom they originated and perished with them.

Thus, through the negligence of historians, whose duty it was to chronicle the institutions of their country, we have no adequate record of these spectacles, but are able to form only a confused idea of them, founded in many respects on pure conjecture. In regard to the goals, we are no more accurately informed. Pausanias makes a mere passing allusion to them in the following passage: "At one of these goals we see a statue of Hippodamia, holding a ribbon in her hand, as if about to crown Pelops, already sure of victory;" but these words, "one of the goals," are sufficient to prove that there must have been several. Common-sense, indeed, teaches us that at least three were necessary: one for horses, another for two-horse chariots, and a third for cars drawn by four horses.

Now, imagine this multitude of horses and chariots all assembled at the gathering-place, for the purpose of affording Greece a spectacle worthy of herself. The combatants are prepared, and the horses, only waiting the signal to fly at lightning speed into the lists, testify their ardor and impatience by the restlessness of their movements. We compre-

hend very easily that contests like these could not fail to be exceedingly perilous. Sometimes a horse would stumble, and the light chariot receive a shock sufficient to shake the charioteer from his position, which was generally a standing one ; sometimes the four horses, impelled to their utmost speed, and becoming excited beyond all control, would seize the bits between their teeth, and gallop madly over the course, dragging their luckless master helplessly along. "Fertur equis auriga neque audit curius habenas." Again, an axletree would break, and the driver, falling to the ground, was fortunate indeed if he escaped being trampled beneath the hoofs of the flying coursers. Homer and the Greek tragedians furnish us many examples of such accidents.

But even more perilous was the encounter of one chariot with another, in the endeavor to gain the slightest advantage ; for naturally each charioteer, regardless, in his excitement, of the probable consequences to himself, did all in his power to hinder or overturn his rival.

The space, too, in which they contended was by no means very extensive ; and being compelled to follow almost the same path, in order to attain the goal, the highest degree of skill and dexterity could hardly suffice to prevent casualties of the most serious nature. As it was a point of honor to make the nearest possible approach to the goal, here was another source of danger ; and Nestor, in his counsel

to his son, part of which we have already quoted, concludes his advice by bidding him beware of striking the stone that served as a goal, lest he should wound his horses and shatter his chariot to fragments.

As the peril increased towards the end of the course, it was then a loud flourish of trumpets was played, animating men and horses to renewed efforts. Dexterity, however, was more necessary than swiftness, for frequently the horses, being pushed beyond their strength, lost their wind and failed to double the goal. Hence the comparison which Cicero employs in the fourth book of his "Academical Questions," "I shall imitate the example of a wise charioteer, and spare my horses in order to be able to finish my course." Callisthenes, in a fragment still extant, relates that Alexander in his early youth contested the prize in a chariot race at the Olympic games, and obtained the victory by his prudence and discretion. The majority of his rivals had passed him, but some, rendering their horses useless by injudicious haste, were unable to advance further; while others, in their ardor and impetuosity, came into collision and dashed their chariots to pieces. A certain Nicolaus alone retained for a brief space the advantage he had gained; but Alexander, foreseeing that, in his excessive eagerness, he would eventually meet the same fate as the others, did not allow himself to become disquieted; and

soon Nicolaus, rushing against the ruins of a chariot that obstructed the path, fell with his horses, and left Alexander sole competitor for the prize.

He gained the goal, doubled it, finished the race, and presented himself as victor before one of the Hellanodices, who, as he placed the crown upon the youth's head, uttered these memorable words : " Believe me, Alexander, just as you have won the victory in this race, so you shall win many another one in war"—words which filled the breast of the young hero with noble joy, and perhaps first awakened in his soul the desire to embark in the grand enterprises that in all succeeding ages have astonished the universe.

It is manifest, then, that the goal was a place of extreme danger, where many an unhappy combatant met with misfortune and lost his hope of victory ; and equally manifest that, notwithstanding the danger, it was necessary, in order to win the crown, to reach the goal first and double it successfully, probably more than once ; indeed, in the opinion of several authors, the whole circuit of the Stadium was made twelve times in each race.

And now the question arises, did the women who gained the prize in chariot races at Olympus compete in person or by proxy? Pausanias informs us in one place that any woman detected in the act of viewing these games, or who should even have passed the Alpheus during the time of their celebra-

tion, would have been pitilessly hurled from the summit of Mt. Typens; and, on the other hand, he mentions three women who had won renown through their success at chariot races, viz., Cynisca, daughter of Archidamus, King of Sparta, and sister of the great Agesilaus; Euryleonis, another woman of Sparta, and the Macedonian, Bellistria.

Again he asserts that Chamyne, the priestess of Ceres, and other virgins had their appointed places in the lists of Olympia, from which conflicting accounts we may infer that if women were forbidden by law to witness the exercises of the pancratium and pentathlon, on account of the indecency of these contests, there was certainly no cause to prevent them from being spectators or even participants in horse and chariot races, where all was noble—where there was nothing calculated to call the faintest blush to the cheek of modesty.

It seems more than probable, however, that women did not enter the lists of Olympus in person, but merely sent thither their horses and chariots with a substitute.

The manners and customs of Greece did not favor the presence of women in public, much less their becoming a spectacle for the amusement of the populace. It was not even necessary that men, in order to gain the victory, should drive their own chariots or ride their own horses over the race-course any more than at the present day. The horses won the crown

of olives and their masters wore it. Philip of Macedon was proclaimed victor at the Olympic game at the very time he was besieging Potidæa. Plutarch relates that this prince, favored of fortune, received on the same day three pieces of intelligence each more joyful than the last : first, that a son had been born to him ; secondly, that his general, Parmenio, had defeated the Illyrians ; and, thirdly, that he had won a crown of olive at Olympus.

And now it remains to say a word or two concerning this recompense, that, despite its apparent insignificance, was deemed a fitting reward for the most marvellous achievements in contests so perilous.

And to begin with, we must admit that he who first said, "Opinion governs the world," spoke not without reason. Who could believe, were not the fact too well attested for doubt, that in the hope of being privileged to wear a wreath of olive leaves, a whole nation would devote itself to the practice of exercises in the highest degree painful and hazardous? But, on the other hand, the Greeks, by a wise policy, had attached such honor and distinction to the obtaining of this crown, that it is not surprising a people whose ruling passion was the love of glory believed they could not pay too dearly for this which of all honors was the most flattering.

It is no exaggeration when Cicero declares in his Epistles from Tusculum, that, in the estimation of the Greeks, this olive crown was equal in value to a con-

sulship ; and in his oration from Floccus, that to gain the victory at Olympus conferred greater glory upon a Greek than the honor of a triumph upon a Roman.

The successful contestant was proclaimed victor by a public herald and the sound of the trumpet. Not only was his own name mentioned, but that of his father, of the city that gave him birth, and sometimes even of his tribe. He was crowned by the hand of one of the Hellanodices, and conducted in pomp to Prytaneus, where a public and sumptuous banquet awaited him. When he afterwards returned to the city, his fellow-citizens assembled in throngs to welcome him, and, persuaded that the glory with which he was crowned rendered their country illustrious and reflected its splendor upon themselves, received him with acclamations and all the magnificent accomplishments of a triumph.

He never again needed to fear either poverty or humiliation ; his native state provided for his maintenance, and perpetuated his fame by monuments which seem to bid defiance to the destroying touch of time ; and the most celebrated statuaries solicited the privilege of representing him with the tokens of his victory, in marble or bronze, in the sacred Grove of Olympus.

Later on, when Rome had reached the height of her glory, she had few if any enemies left to contest with. Fearing, in consequence, a relaxation of the physical strength of her people, and partly to satisfy

in a degree the bloodthirsty desires of some of her emperors, she established the Arenas, where for the first time were enacted the tragical games of the gladiators.

This barbarous custom, however, seemed to be a forerunner of the decline of the Roman Empire, which, through the great energy of her early heroes, had reigned supreme during five hundred years, enlightening the world with the highest order of civilization, and giving birth to such illustrious men as Scipio, Cincinnatus, Virgil, Cicero, and Cæsar.

Passing from this era to the next, that of the Middle Ages, we find tournaments first mentioned. They were the grand spectacles of this epoch. The champions, generally young men of the nobility, entered the lists, mounted on steeds, encased in armor, richly caparisoned, and always surrounded by a strong body of men-at-arms.

Here they challenged each other to break one or more lances.

The victor of the contest received not only a crown of laurel or oak as a reward for his prowess, but what was, no doubt, more acceptable, the hand of the fairest and wealthiest châtelaine of the assembly; hence the saying that these heroes were "crowned by the hands of the Graces."

Nothing can be more descriptive or thrilling than an account of these tournaments given by Sir Walter Scott, in "Ivanhoe."

Now, however, since the human race has become more polished and the world in general more civilized, these ancient diversions have taken a much milder form, attended with far less danger, and at the same time an equal amount of exertion required.

The chariot-races and tournaments of the Middle Ages have been succeeded by the modern race-course and the numerous advantages of the manège; and it cannot for a moment be doubted that these, together with tandems and four-in-hand equipages of to-day, are far preferable to the chariots and tournaments, without the hazardous and sometimes tragical end attending the ancient games.

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